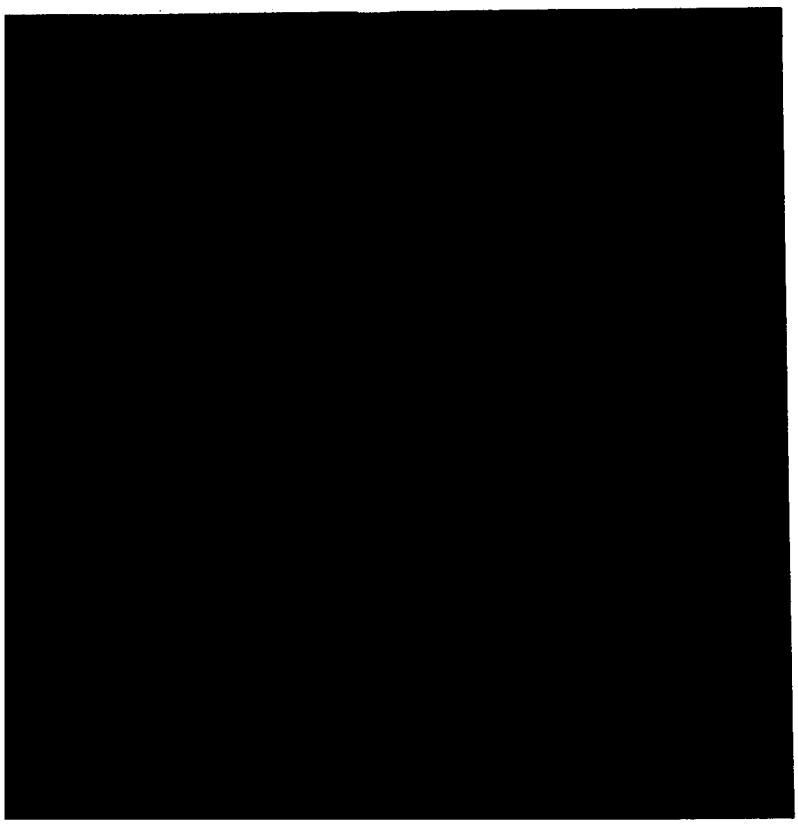
SERVICE MANUAL

HIGH SPEED 9PIN DOT PRINTER

SP-0930N



SAMSUNG

SERVICE MANUAL

HIGH SPEED 9PIN DOT PRINTER

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CHAPTER 1
SPECIFICATION

☐ PRODUCT SPECIFICATION

Printing Type

Serial Impact Dot Matrix (9 PIN)

Printing Speed

High Speed Draft Pica	300 CPS (50DPI)
Draft Pica	250 CPS (60DPI)
NLQ Pica	50 CPS (120DPI)

Maximum Printing Range

203.2mm (8 inch)

Character Styles

Standard ROM Font
Italics
11 International Character Sets
Super/Subscripts
Double Strike
Emphasized
Proportional Mode
Underscore/Overscore
Double Wide

Print Direction

Bi-directional Logic seeking in text mode
Uni-directional in bit image graphic mode

Character Format

Text Mode :	High Speed Draft	7 * 9 (H * V)
	Draft	9 * 9
	NLQ	22 * 18
Graphic Mode :	8 * 480 dots (60DPI)	
	8 * 576 dots (72DPI)	
	8 * 640 dots (80DPI)	
	8 * 720 dots (90DPI)	
	8 * 960 dots (120DPI)	
	8 * 1920 dots (240DPI)	
	9 * 480 dots (60DPI)	
	9 * 960 dots (120DPI)	

Character Per Line

Pica	80	Pica Enlarged	40
Elite	96	Elite Enlarged	48
Compressed	136	Elite Enlarged	68

Printing Modes

Fixed Pitch Mode
Proportional Pitch Mode

Line Spacing

1/6" Default
N/216" (Emulated to 1/144" accuracy)
Reverse Line Feed (Restricted per FX-85)

Paper Handling

Built in Push Tractors with Paper-Parking
Friction Feed
Auto Single Sheet Load
Paper Out Detect

Paper Type

Fan-Fold Paper 3 - 9.5 inch wide
Roll Paper 4 - 9.5 inch wide
Cut Sheet Paper 4 - 9.5 inch wide
Copy Original + 3 Copies (0.016 inch max, thickness)

Ink Ribbon

Epson FX-80 Compatible Ribbon

Emulations

IBM Proprinter & Epson FX-85 (DIP Switch selectable)

Interface

Centronics Parallel Standard
RS-232C Serial Optional

Input Buffer

3K Bytes Standard (11K Bytes Optional)

Power Requirements

U.S.A model	: 120 VAC, 60 Hz
Europe model	: 220-240 VAC, 50Hz

Power Consumption

Operating Time	: 1.0 Amps 120 Wattes
Standby Time	: 0.2 Amps 25 Wattes

Noise Level

Mechanical : Less than 60 dB
Electrical : FCC Class B
VDE Class B

Dimension

335 (W) * 333 (D) * 120 (H) mm

Weight

8.5 Kilograms

Reliability

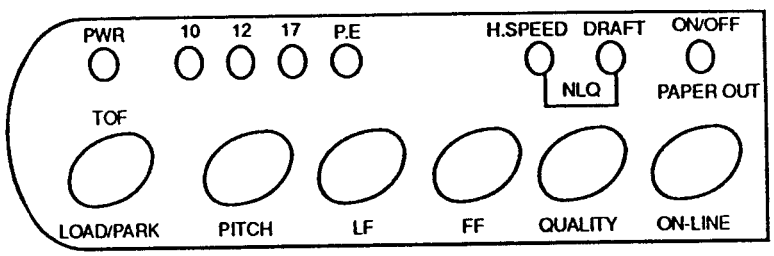
MTBF : 4,000 Hours excluding Printhead
(25% Duty Cycle & 30% Print Density)
Printhead Life : 150 Million Dots/Pin

CHAPTER 2
OPERATION

☐ SWITCHES AND INDICATOR

☐ *Power Switch*

The power switch is located on the right side of the printer. It is used to turn the AC power ON or OFF. When the power is supplied to the printer the power indicator light on the front panel will be lit.



☐ *Selection Switches on Front Panel*

The 6 panel selection keys are located on front panel.

ON-LINE switches

This is an alternate action switch which opens and closes communication line between printer and the computer.

When the power switch is turned on, the printer will power up in ON LINE if the paper is installed. If paper is not installed, the printer will power up in OFF LINE mode.

In the ON LINE mode, the printer can receive the information from the computer and the ON LINE indicator will be lit. When OFF LINE, the printer can no longer receive the data and the indicator light will go out.

LOAD/EJECT switch

Off line : Press this button to load paper if paper is not loaded, or to eject it if paper is loaded. Paper is ejected backward.

On line : Press this switch to indicate the paper is now located on Top Of Form.

QUALITY switch

Selects cyclically one of the printing mode among High Speed Draft, Draft or NLQ. This switch is valid only in OFF LINE mode.

In High Speed Draft mode, the printer uses the 9 * 7 character with 300 cps printing speed. In Draft mode, 9 * 9 font with 250 cps and in NLQ mode, 18 * 22 font and 50 cps. High Speed Draft is valid only in IBM ProPrinter Emulation Mode. In addition to the mode change from front panel, the user can select the printing mode through ESCape code control.

PITCH switch

Selects one CPI (Character Per Inch) from 10, 12 and 17 CPI. 17 CPI is not available for H-S Draft mode and EPSON NLQ mode. This switch is valid only in OFF LINE mode.

LF (Line Feed) switch

Off line : Press this button to feed the paper one line or hold it down to feed the paper continuously.

On line: You can use the micro - adjustment features by pressing this button to advance the paper.

FF (Form Feed) switch

Off line : Press this button to feed the paper one page or hold it down to feed the paper continuously.

On line: You can use the micro - adjustment features by pressing this button to reverse the paper.

☐ *LED Indicators*

Power Indicators

This LED indicates the power on/off status of the printer and is always lit when the power is supplied to the printer.

ON/OFF Indicators

This LED indicates the ON or OFF LINE status of the printer. And goes out when the ON/OFF switch is pressed in ON LINE state or when the PAPER OUT is detected.

QUALITY Indicators

There are two LEDs marked as H-S and DRAFT, to indicate the printing mode. Both the DRAFT and H-S indicator being lit means that the printer is in NLQ mode.

CPI Indicators

There are three LEDs marked as 10, 12 and 17, to indicate the CPI status of the printing mode, which tell how many characters will be printed in 1 inch.

10 -- 10 CPI (PICA)
12 -- 12 CPI (ELITE)
17 -- 17 CPI (Compressed)

Paper Out Indicators

This LED indicates the Paper Out status of the Printer.

☐ DETECTORS

PAPER OUT Detector

The PAPER OUT Detector is located behind the platen and senses the absence of the paper. When the printer runs out of paper, the following conditions are met.

- The printer does not accept data from the computer.
- The printer goes OFF LINE and the Paper-Out light goes ON.
- All the selection switches are active.

HOME POSITION Detector

On the left under of the platen locates an optoelectronic sensor which emits electronic signal when the printhead comes to the left printing edge. This Detector is used when there is a need to reset the printhead position because of the mode change, or etc. The general user do not have to concern about this.

☐ INITIALIZATION

Power Up Sequence

The following procedures should be followed when turning the printer on:

1. Make sure that the carriage fastener has been removed.
2. Set the DIP switches on the rear side as required.
3. Be sure that the Ribbon Cartridge is installed correctly.
4. Load the paper and set the paper feed selector, friction or tractor feed.
5. Plug the AC power cord into an appropriate wall outlet and turn the power on.

Initialization

The printer is initialized under the following conditions.

- the AC power is turned on.
- the-INIT signal is received.
- the RESET command (ESC @) is received in EPSON FX-85 Mode.

When the printer is initialized, the following changes will occur.

- the printhead goes to the leftmost position which is called home position.
- the print buffer is cleared.
- the input buffer is cleared (not cleared by RESET command).
- vertical tab settings are cleared.
- horizontal tab settings are set every 8 columns.
- all the operating conditions set by control and escape commands are cleared.

- the DIP switches are read and the operating conditions are determined as required.
- the print mode is reset to default print mode as set by DIP switches.
- current printhead position is designated as top of form
- the printer goes ON LINE.

☐ SELF-TEST

The printer has the Self-test feature which allows the user to test the printer independent of the computer. The Draft Self-test is activated by turning the power on while pressing the LF switch. The NLQ Self-test is activated by turning the power on while pressing the FF switch. The High Speed Draft Self-test is activated by turning the power on while pressing the TOF switch. In order to stop the Self-test Mode, you should turn down the power switch.

☐ HEX DUMP

The Hex Dump mode is activated by turning the Power on while pressing the both the LF and FF switches. In this mode, all data received from the computer is printed in hexadecimal code rather than the normal ASCII characters. Control codes for the printer (CR, LF, HT, VT, etc) are not executed. To reset this mode, turn the power off, then back on. This mode is useful when the programmer is debugging his program for the printer or one is suspecting the operation of the printer and want to check if the printer is working correctly.

☐ DIP SWITCHES

On the rear side of the printer, you can see the 16 DIP switches. These switches are intended to be used for the selection of the certain operating conditions of the printer, like IBM or Epson printer mode, 6 Lines per Inch or 8 Lines per Inch mode, etc.

> *CAUTION* *When you want to change the DIP switch settings, turn the power off before setting.*

The Table below shows the location of the DIP switches and summary of the switch settings. These settings are read only on power up and determines the selected operating conditions.

These operating conditions can be selected through software commands also.

DIP switch 1

Switch Number	Meaning	ON	OFF	Factory Setting
1	Default Line Spacing	1/8 inch	1/6 inch	OFF
2	Slashed zeros	Slashed zeros	Normal zeros	OFF
3	Automatic Line Feed	Automatic LF after CR	No LF after CR (ESC C can override)	OFF
4	Form Length	12 inches	11 inches	OFF
5	Character Set	Set 2 (ESC 7 can override)	Set 1 (ESC 6 can override)	OFF
	Meaningful in IBM ProPrinter emulation mode			
6	Automatic CR	Automatic CR on LF, VT and ESC J	NO Automatic CR on LF, VT and ESC J	OFF
7	Reserved for Factory Test			
8	Reserved for Factory Test			

DIP switch 2

Switch Number	Meaning	ON	OFF	Factory Setting
1	Emulation	Epson FX-85	IBM Proprinter	OFF
2	Download Buffer or Input Buffer	Enable Download Buffer	Disable Download (Increase Input Buffer	OFF
3	NLQ	ON	OFF	OFF
4	1 inch Skip Over Perforation	Enable	Disable	OFF
5	Paper Out Sensor	Disable	Enable	OFF

DIP switches 6, 7 and 8 are reserved for the selection of international character sets in EPSON MODE.

6	7	8	Country
OFF	OFF	OFF	U.S.A.
OFF	OFF	ON	France
OFF	ON	OFF	Germany
OFF	ON	ON	England
ON	OFF	OFF	Denmark
ON	OFF	ON	Sweden
ON	ON	OFF	Italy
ON	ON	ON	Spain

☐ INPUT BUFFER

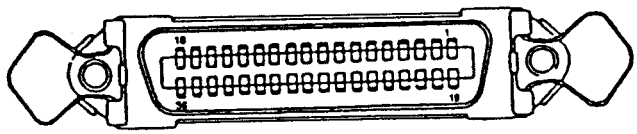
The data transmission speed from the computer to printer is fairly higher than the speed that the printer can print characters. So letting the computer wait until the print completes printing on each line is not an efficient way. Instead, having a large input buffer hold all the received characters, we can free the computer from the job of sending in short time and therefore can increase the efficiency. This printer has 3K bytes input buffer as a default, and this is enough size of buffer almost for every application. If you still want a larger input buffer, you can expand the input buffer up to 11K bytes. The procedure for expansion is so simple.

Remove the printer top cover, then you will see the 28 pin blank socket. Then insert the 8K bytes SRAM, 6264, into this socket. That's all. The control firmware of the printer is so intelligent that it can detect the installation of expanded buffer automatically.

CHAPTER 3
INTERFACE

☐ THE PARALLEL INTERFACE

☐ *Input Connector*



Signal Diagram

1) Synchronization : Externally supplied STROBE pulse
2) Handshaking : $\overline{\text{ACK}}$ and BUSY signal

Pin	Return	Signal	DIR	Description
1	19	$\overline{\text{Strobe}}$	IN	Strobe pulse for the data entry. Pulse should be more than 0.5 microseconds at the receiving terminal. This signal is "High" in the normal condition, and data are read in after this signal has turned to "Low".
2	20	Data 1	IN	Each signal represents the information of the 1st to 8th bits of parallel data. "High" shows that data is local "1" and "Low" is "0".
3	21	Data 2		
4	22	Data 3		
5	23	Data 4		
6	24	Data 5		
7	25	Data 6		
8	26	Data 7		
9	27	Data 8		
10	28	$\overline{\text{Ack}}$	OUT	"Low" indicates that the printer has received data and is ready to accept next data. Pulse width is about 12 microseconds.
11	29	BUSY	OUT	"High" indicates that the printer is not ready for receiving data, while "Low" indicates that the printer is ready for receiving data.
12	30	PE	OUT	"High" indicates that the printer is out of paper.
13		SLCT	OUT	"High" indicates that the printer is selected
14		$\overline{\text{A.FEED}}$	IN	When this signal turns to "Low" paper is automatically fed one line after printing.
15		NC		Not used.
16		GND		Logical ground 0V level

Pin	Return	Signal	DIR	Description
17		Chassis GND	OUT	GND level of the printer chasiss
18		NC		Not used
19		GND	OUT	Signal GND level for twisted pair return.
|		|		
30		GND		
31		$\overline{\text{INIT}}$	IN	When this signal turns to the "Low", the printer is reset to the initial condition and the printer buffer is cleared. The pulse width should be more than 50 microseconds at the receiving terminal.
32		$\overline{\text{ERROR}}$	OUT	"Low" indicates that the printer is in: 1. Paper Out 2. Off line condition 3. Printer Error
33		GND	OUT	Same as specified in pin No. 19-30.
34		NC		Not used.
35				Pulled up to +5V through 4.7 Kilo-ohms resistor.
36		NC		

☐ *Electrical Conditions*

Signal Levels

All signals are TTL level.

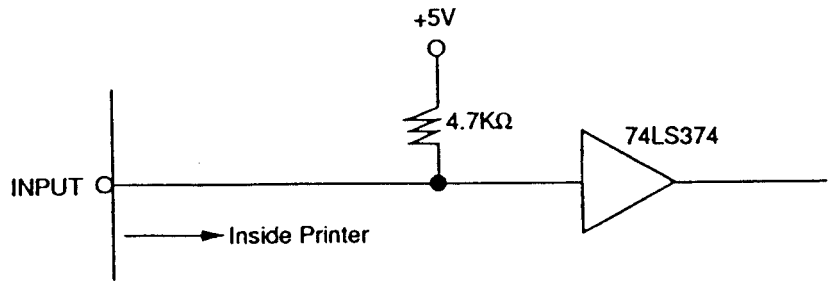
High level	---	+2.4 - 5.0 V
Low level	---	0 - 0.4 V

*This is measured at the input pins on the printer.

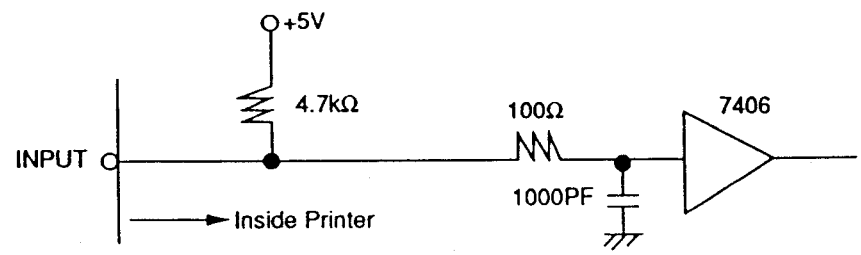
Input/output conditions

a) input signals

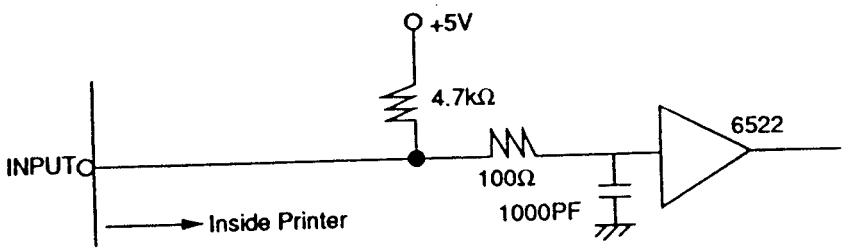
* DATA1 - DATA8



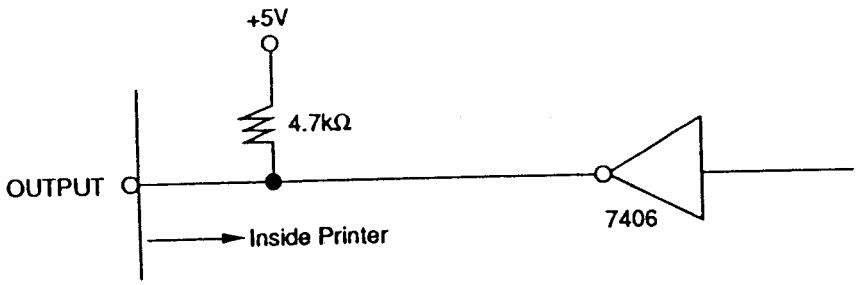
b) $\overline{\text{Strobe}}$ signals



c) $\overline{\text{INIT}}$ & $\overline{\text{A.FEED}}$ signal



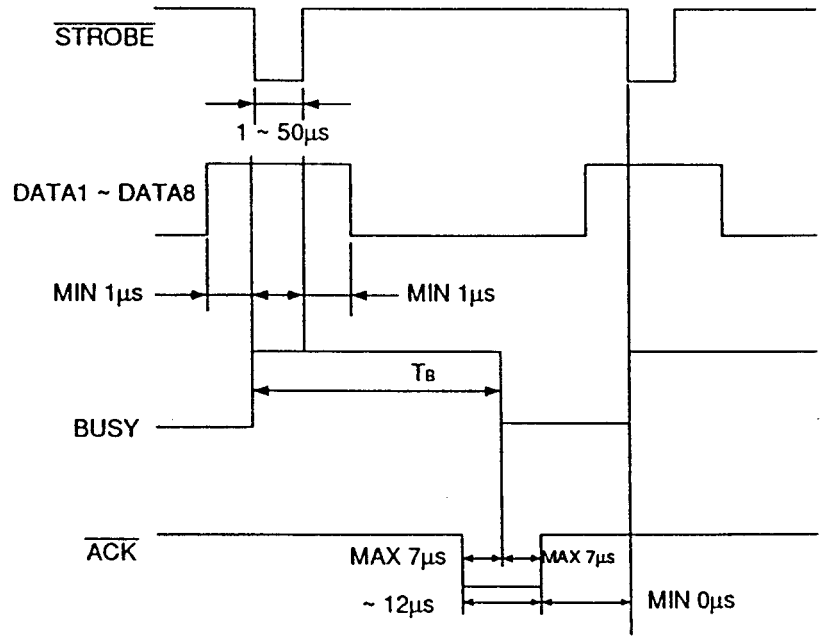
d) Output signals



e) Signal cable length
The maximum length is 2 meters and all the signal lines should be run as twisted pairs with the GND lines.

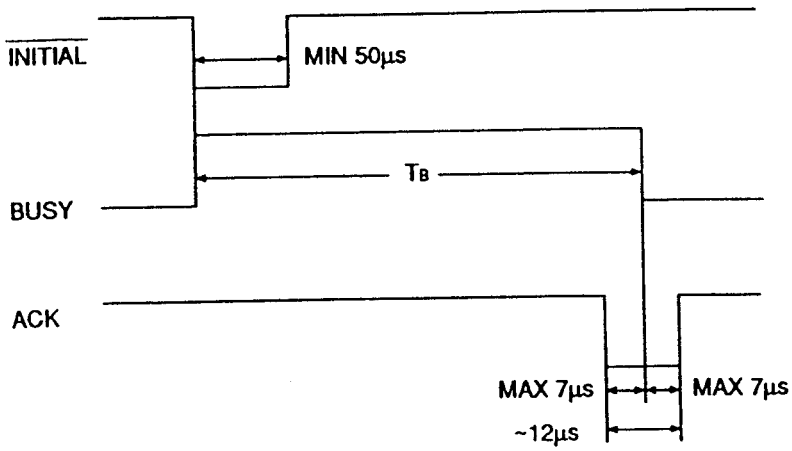
☐ *Timing Chart*

Data Interface between PC and printer



TB: differs depending on the input data.

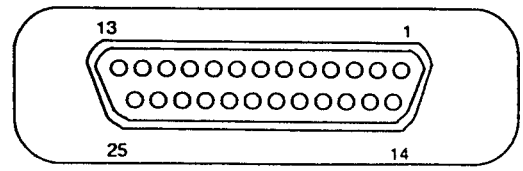
Initialization



TB: differs depending on the position of the head carrier.

☐ THE SERIAL INTERFACE

☐ *I nput connector*



< EIA - rated 25 pin cannon type connector >

1) Synchronization : Asynchronous system
2) Baud rate : 300 - 19200 (user selectable)
3) Handshaking
   Flow control : DTR
   space = data entry possible
   mark = data entry not possible
   XON/XOFF : TXD
   XON <11H> = data entry possible
   XOFF <13H> = data entry not possible

Pin	Signal	
1	FG	Printer chassis ground
2	TXD	Serial output data
3	RXD	Serial input data
4	RTS	
5	CTS	
6	DSR	This signal must be in space status if the computer want to send data to the printer.
7	SG	Signal ground
8	DCD	
20	DTR	This signal indicates that the printer is busy status when it is in mark status.

☐ *Electrical Conditions*

Signal level

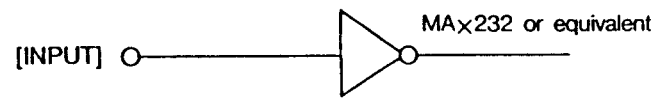
All signals are RS-232C level.

ON : Space --- +5V — +15V

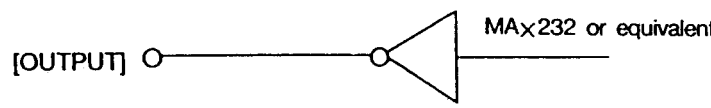
OFF : Mark --- - 5V — - 15V

Input/ output conditions

* input signal



* output signal



☐ *Handshaking Protocol*

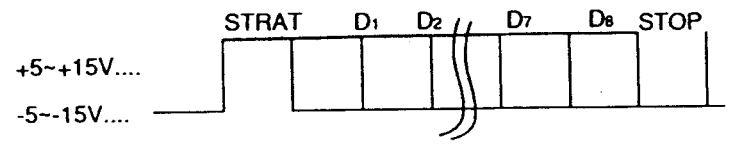
READY/BUSY Protocol

The DTR line indicates the READY/BUSY state of the printer. When READY, ON(+12V) is output and when BUSY, OFF(-12) is output. When the remaining space of the communication buffer goes below 128 bytes, the DTR line turns OFF, terminating the transmission of data from the computer. Then when the buffer space increases to above the 256 byte level the DTR line turns ON, allowing data to be sent from the computer. The DTR line turns OFF when a paper out is detected or when the printer goes OFF line.

X-ON/X-OFF Protocol

When the printer can receive data, X-ON is output. When the printer is not able to receive data,X-OFF is output. When the computer receives the X-OFF signal, transmission of data to the printer is terminated. If the X-ON signal is then received, data is transmitted once again. When the communication buffer space goes below 128 bytes, X-OFF is sent. When the buffer space goes beyond 256 bytes, X-ON is sent. X-ON is DC1(11 HEX) and X-OFF is DC3(13 HEX). These signals are output through the TR line. The data format is the same as the input data structure.

☐ *Serial Data Frame*



Word length

Start bit	:	1 bit
Data bit	:	7 or 8 bit
Parity bit	:	odd, even or non-parity
Stop bit	:	over 1 bit length
space	:	logical '0' (+5V - +15V)
mark	:	logical '1' (- 5V - - 15V)

Data Length 7 or 8 Bit Selection

A 7-bit or 8-bit data length may be selected by DIP switch 2. When the switch is ON, the 7-bit length is selected. When the switch is OFF, the 8-bit length is selected.

Stop Bit

One bit or more is required for the stop bit. However the 7-bit data length and no parity are selected, is there a need for 2 or more stop bits.

Parity

Whether a parity bit is to be used, and whether odd or even parity is to be used is selected by DIP Switch 3 and 4.

☐ *Serial DIP Switch Settings*

All DIP switch selections must be performed while the power is off.

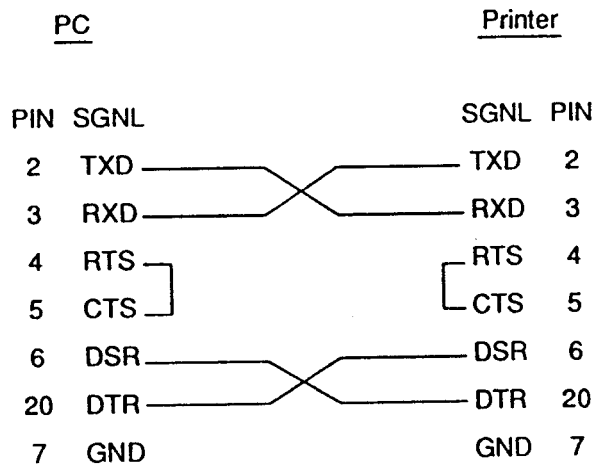
Serial DIP switch settings

Switch	Settings	Meaning	Factory Setting
1	ON OFF	XON/XOFF Enable XON/XOFF Disable	OFF
2	ON OFF	Data Bit Length = 7 Data Bit Length = 8	OFF
3	ON OFF	Parity Enable Parity Disable	OFF
4	ON OFF	Odd Parity Even Parity	OFF
	This switch is meaningful only when the parity option is enabled through switch 3.		

DIP switches of 5, 6, 7 and 8 are used to select baud rate.

5	6	7	8	Baud rate
OFF	OFF	OFF	OFF	300
OFF	OFF	OFF	ON	110
OFF	OFF	ON	OFF	300
OFF	OFF	ON	ON	600
OFF	ON	OFF	OFF	1200
OFF	ON	OFF	ON	1800
OFF	ON	ON	OFF	2400
OFF	ON	ON	ON	4800
ON	OFF	OFF	OFF	9600
ON	OFF	OFF	ON	19200

☐ *Cabling for Connecting with IBM-PC*



NOTE *If you want to use the Parallel Interface when the Serial Board has been installed, remove the Serial Board.*

CHAPTER 4
ELECTRICAL CIRCUIT

☐ POWER PCB(MPC-AC)

The power PCB is consisted of an AC switch, a fuse and a noise filter. When the fuse used in this PCB is blown, replace it with the one designated. Unplug the power cord from a wall outlet before replacing it.

☐ TRANSFORMER

The thermal fuse in the primary is designed to blow off if the internal temperature exceeds approximately 130°C. Since it is impossible to replace the thermal fuse, the transformer as a whole must be replaced when the fuse is blown.

POWER SUPPLY CIRCUIT

The DC voltages required to operate the mechanisms and control circuits are supplied from this power supply circuit. Table 4-1 lists the types and applications of the drive and control voltages.

OUTPUT VOLTAGE	TYPES AND APPLICATIONS
+5 Vdc	* Logic and Control circuit * Motor Drive Circuit * LED Drive at Control Panel
+ 14 Vdc	* Printhead Drive
+ 27 Vdc	* Printhead Drive * Buzzor Drive
+ 36 Vdc	* Printhead Drive * Motor Drive

Table 4-1 Types and Application of Voltages

Figure 4-1 shows a block diagram of the power supply circuit. External AC Input is applied, via Input Filter, to the Power Transformer(T101). External noise on the AC Input line is attenuated by the Input Filter(C101,102,103, and L101). The secondary AC output voltage of power Transformer is converted to DC voltage by the rectifiers, and smoothed by the smoothing circuits. Rectifier and smoothing circuit(1) (D7,8,9,10 and C49) outputs +36 Vdc and Rectifier and smoothing circuit(2) (D3,4,5,6 and C48) outputs +14 Vdc. Negative Voltage Regulator(U23) outputs +27 Vdc, which is smaller 9 V than +36 V.(+36 V - 9 V). +5 V is supplied from DC to DC converter(U22).

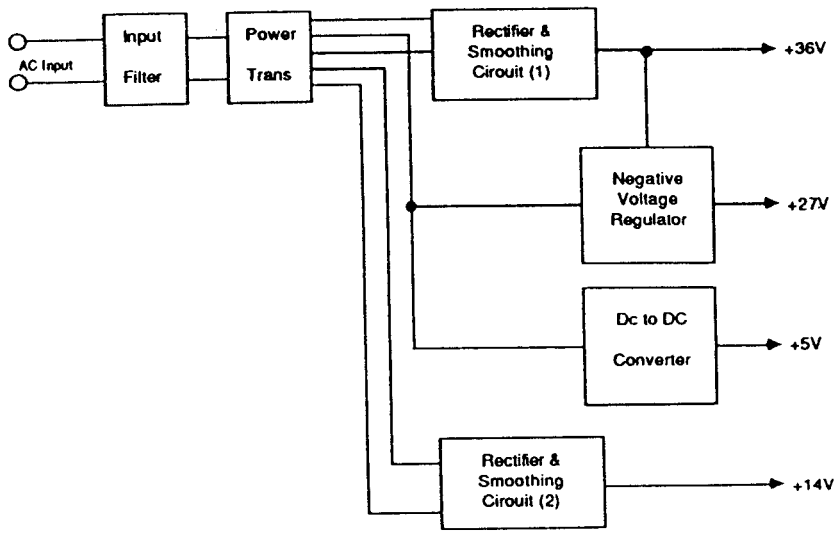


Figure 4-1 Block Diagram of the Power Supply Circuit

☐ RESET CIRCUIT

— Reset circuit initializes microprocessor and other chips when power is turned on.
Figure 4-2 shows the reset circuit.

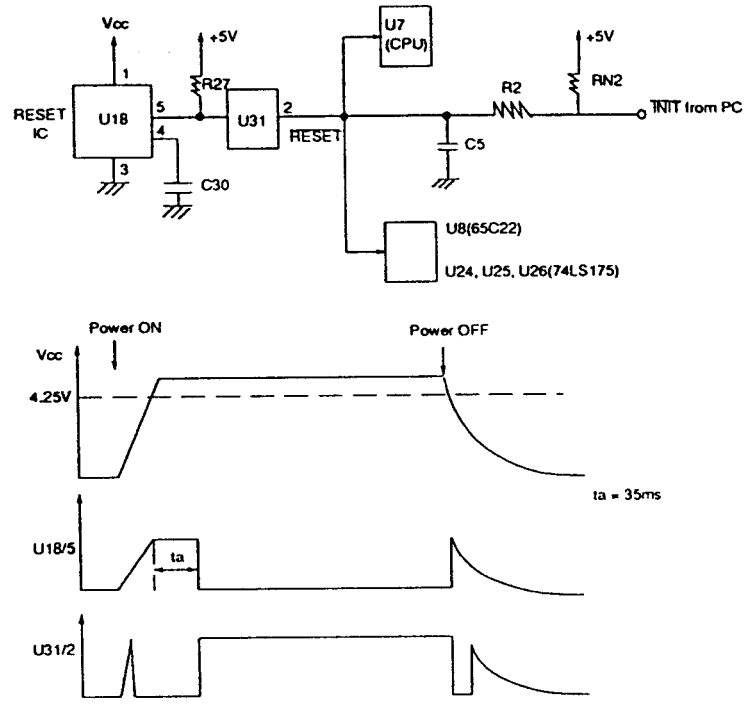


Figure 4-2 Reset Circuit

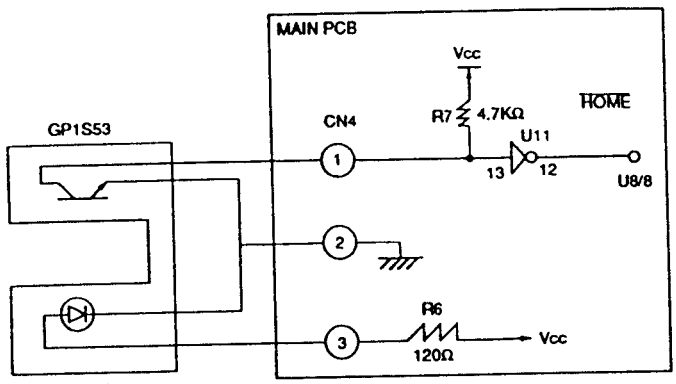
— The $\overline{\text{RESET}}$ signal at U18/5 is allowed to stay High Level after the voltage level at U18/1 exceeds 4.25VDC. It's about 35ms.

— RESET signal is inverted to $\overline{\text{RESET}}$ signal through U3/(7406).

— ta ≒ 0.34 x C30 (pF) μSec

☐ DETECTING CIRCUIT

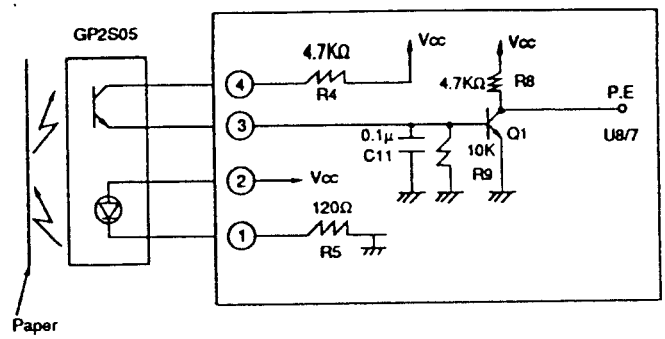
— Home Sensor



$\overline{HOME}$ < 0.8V : at home position
$\overline{HOME}$ ≥ 2.4V : out of home position

The home sensor for detecting the head carrier uses a photo-interrupt. When the plate of the head carrier enters the photo-interrupter located at the home position, the photo transistor in it turns off, causing CN4/1 to go "HIGH" and $\overline{HOME}$ signal to go "LOW".

— Paper Empty Sensor

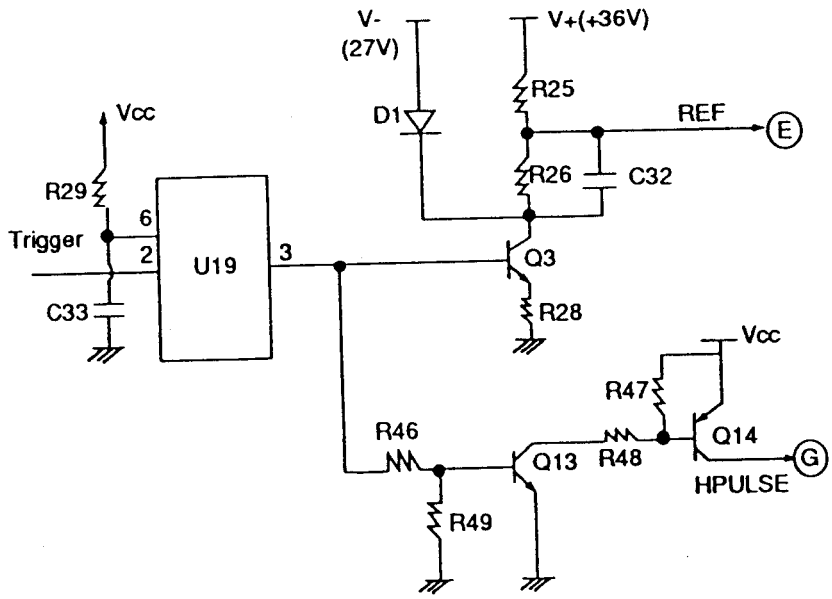


P.E ≥ 2.4V : paper empty
P.E < 0.8V : paper loaded

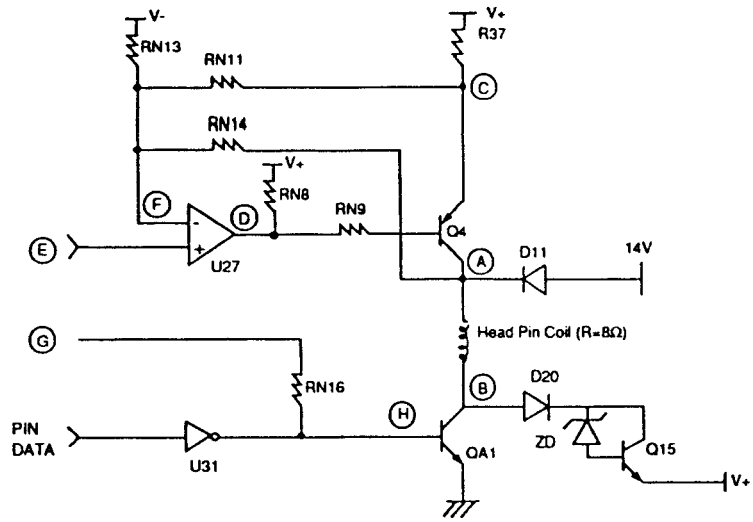
A reflection-type photo interrupter is used to detect a paper empty condition. If the voltage at U8/7 is more than 2.4 volts, the printer is out of paper. If a paper is loaded, the voltage measures less than 0.8 volts.

☐ HEAD DRIVE CIRCUIT

The current of printhead is controlled by the Bi-Level method. The max current is 1.4 Amp which is supplied by +36 volts(V+). Over 1.4A, TIP 127(Q4) is turned off and then current is supplied by +14 volts. The waveform and circuit below shows the operation and the relations of each point.



– When print signal is put to trigger input of 555 timer, the output of 555 goes to high state and the pulse width is determined by the R29 and C33. Transistor Q13, Q14 are turned on and the collector voltage of Q14 becomes about +5 volts, and which acts as the power of open collector, 7406. Each print data is inverted by U30,31 and drives sink driver QA1,QA2,Q16.



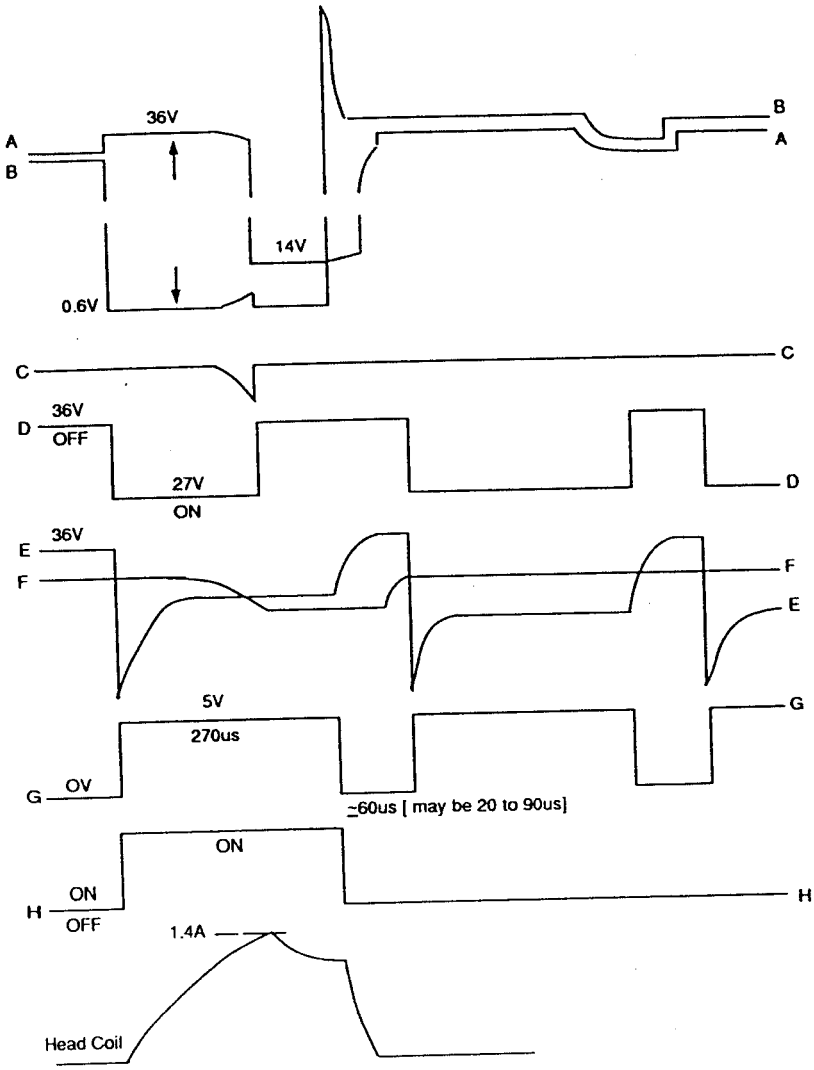
R25,R26,Q3 and +27 volts (V-) consist of the comparator reference input. Q3 is turned on during print enable period and R28 is current limit resistor of Q3.
As Q3 is turned on, the level of point E is lower than that of F. Then comparator output becomes low state and Q4 is turned on. At Q4 On, current flows from A to B.

- When the current through R37 reaches to 1.4 Amp, the level of point F is lowered than that of E by the voltage drop of R37 and RN11. At that time, the level of point D goes to high state, and which turns off Q4.

- Current is supplied by +14 volts through D11 after Q4 is off.

- When QA1 is off, and then point B rises fastly to high voltage so called as fly-back voltage. Diode D20, ZD and Q15 is used to suppress the high fly-back voltage for QA1.

– Each point of head drive circuit is shown below. On upper analysis, each waveform is resulted from the relation of each point.



☐ CR MOTOR DRIVE CIRCUIT

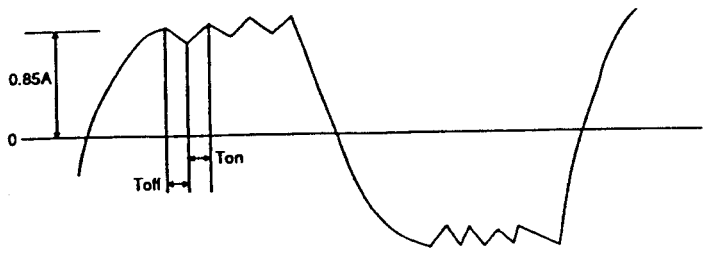
- Driver & motor
  Driver is the PBL3770A which has the internal comparator and H-bridge power stage for chopper drive. Motor is Bi-polar and Hybrid type.

- The circuitry of motor driver is designed to optimize power consumption according to the torque needed to acceleration and constant driving. PBL 3770A has four current level intended to optimize power consumption. The table below shows the relationship between the current level and its control signal.

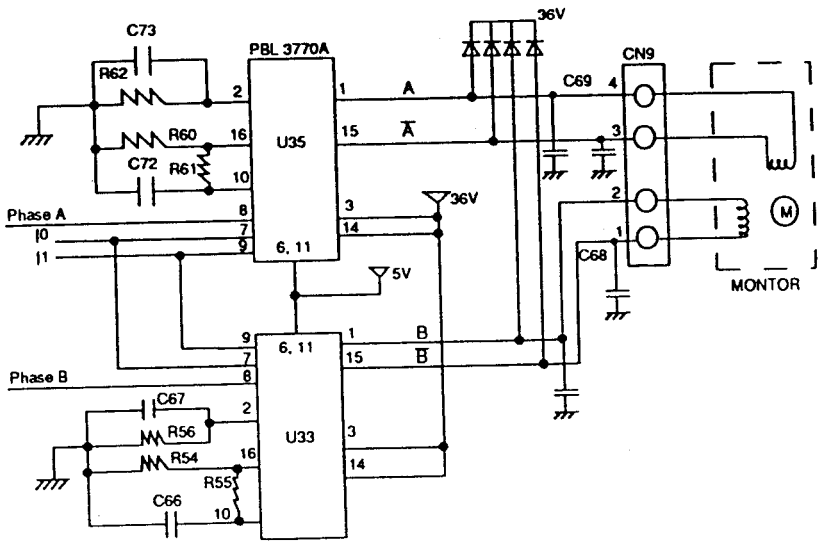
Motor Current(A)	I_0	I_1	Operation
0.85	L	L	Operating
0.51	H	L	Not used
0.17	L	H	Stand - By
0.0	H	H	No Current

** I_0, I_1 are the logic inputs of PBL3770A which control the motor current and their pin No. is pin 9 and pin 7 of U33 and U35 respectively.

– The current waveform flowing through motor wire is as follows



– Phase excitation : always 2-2 phase.



Pin 1 and Pin 15 both of U33 and U35 are output stages of driver. During High state of pin 8(phase signal), current flows from $\overline{A}$, ($\overline{B}$) to A, (B). When phase is in low state, current flows from A, (B) to $\overline{A}$, ($\overline{B}$).

T_{off} is determined by the value of R56,R62,C67 and C73 of pin 2. Pin 7 and Pin 9 are the control signals of current level which are changed according to requested motor mode. Pin 8 is motor phase signal. But pin 8 of U33 and that of U35 are in 90 degree phase difference. Pin 11 is the reference input of internal comparator of PBL3770A. The relation between reference input and peak current is selected as $I_{(peak)} = (V_{ref}/R)*0.085$. R54 and R60 are the current sensing resistors and they are inputs to the internal comparator through low-pass filter consisted of R55 and C66.

– Print mode vs. Motor speed
The motor speed is changed to the value needed to print the requested mode. The printhead-carrier moves by (1/100) inch per step. The table below shows the mode vs. motor speed.

Print Mode	Motor speed	CPI
H. Draft	30 IPS	10
Draft	25 IPS	10
NLQ	15 IPS	10

* H.S is high-speed draft which is available only in IBM Mode.

☐ LINE FEED MOTOR DRIVE CIRCUIT

U32 and U34 are LF motor drivers PBL3717A which has the same electrical specification as PBL3770A, only different from external Diode. R51 and R57 are current sensing resistor. R52, R58,C64 and C70 act as low-pass filter. The T_{off} of motor current in chopper circuit is decided by R53, R59,C65 and C71. C74 and C75, C84, C85 is used to suppress the electromagnetic interference.

- Phase excitation : 2-2 phase.

- Current and Control signal : Pin 9 and Pin 7 of U32 and U34 are the control signal of current level. The current level is described below.

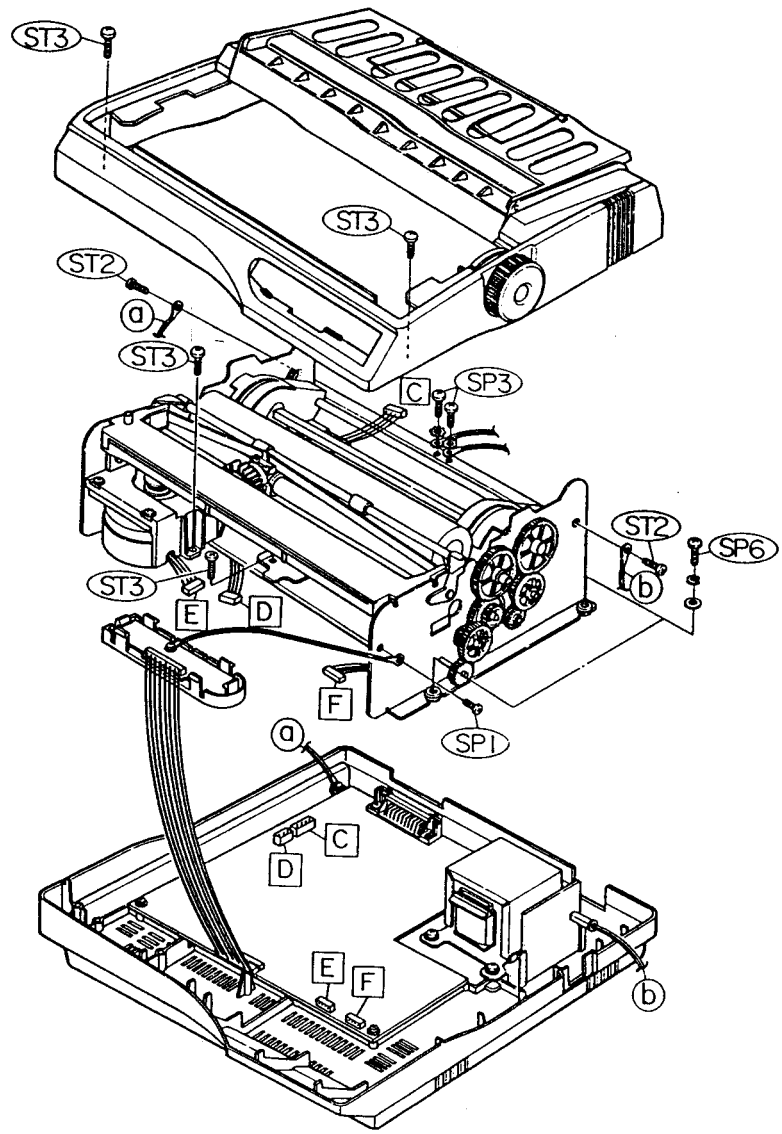
  High current (0.85A) ----------> Operating
  Medium current (0.51A) ----------> Not used
  Low current (0.17A) ----------> Stand - by

CHAPTER 5
REPLACEMENT AND ADJUSTMENT

☐ DISASSEMBLY AND ASSEMBLY OF MECHANISM

1. Unscrew the screw (ST3).
2. Lift the front of the cabinet-top (1) a little, and push the four hooks behind the panel-keypad (11) outside of the cabinet-top pursing it inside.
3. Unscrew the six screw (ST3),(SP6).
4. Pull out the flexible cable from the socket.
5. Separate the ground wire from the mechanism by unscrewing the screw (SP1),(ST2),(SP3).
6. Pull out the connector (C),(D),(E) (F) that is connected to the PCB.
7. Hook the connection cable to the computer and printer.
8. Assemble to the reverse steps 1-6.

CAUTION	*You must pull out power plug before disassembling of the mechanism.*


ST3
ST3
ST2
a
ST3
C
SP3
ST2
SP6
b
ST3
E
D
F
SP1
a
C
D
E
F
b

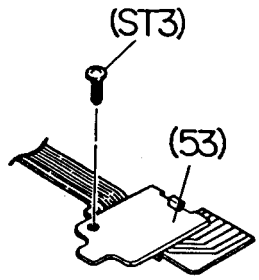
☐ PRINTHEAD REPLACEMENT

1. Unscrew the screw (ST3), and separate the holder cable (53) from the flexible cable.

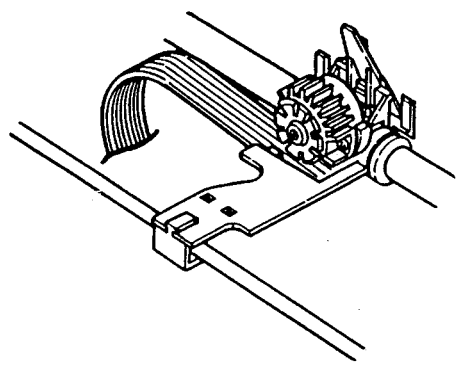
2. Pull out the flexible cable from the socket which is on the main PCB.

3. Unscrew the screw fixing the printhead, and separate the printhead from the carrage.

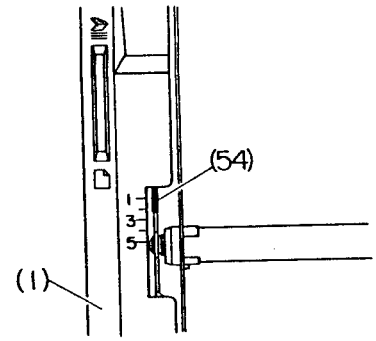
4. Insert the ribbon guide into the new printhead.



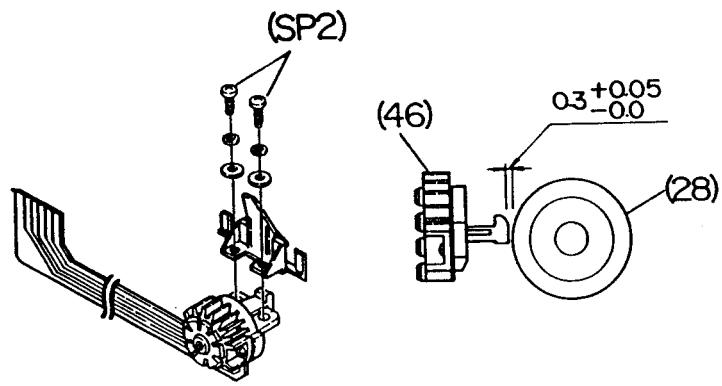
5. Be sure to insert the flexible cable under the spur in order for the cable not to get loose.



6. Set the printhead gap adjustment lever(54) to the mark "1" which is carved on the cabinet top(1).



7. Tighten the screw(SP2) half, and insert the thickness guage which is 0.35mm thick between the platen(28) and printhead (46). Push the printhead behind it to stick to it, and tighten the screw(SP2) completely.
8. Reconfirm if the gap which is between the platen and printhead is 0.30-0.35mm with the 0.35mm thickness guage, and insert the flexible cable into the socket.



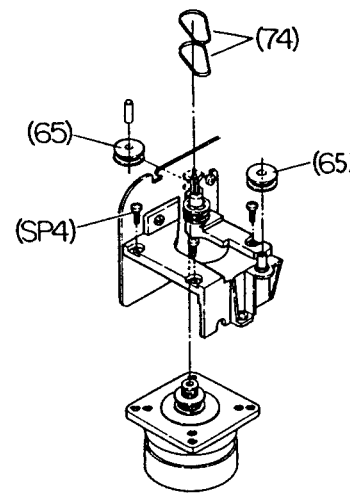
9. insert the flexible cable into the gap of the holder cable, and fix the holder cable with the screw(ST3).
10. Run self-test.

☐ C/R MOTOR REPLACEMENT

1. Referring to the "Disassembly and Assembly of the Mechanism", separate the mechanism from the cabinet bottom(16).

2. Unscrew the screw(SP1), and separate the rear shaft(52) after widening the side frame(76), (79).

3. Pull up the pulley idle(65).
4. Remove the ribbon belt(74).
5. Unscrew the three screws(SP4) fixing the holder motor.



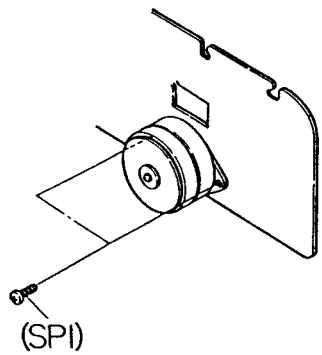
6. To the reverse steps of 1-5 assemble the C/R Motor.

CAUTION	*Confirm the connection of Ground wire(A) to side frame(79) as you assemble the C/R Motor.*

☐ L/F MOTOR REPLACEMENT

1. Referring to the "Disassembly and Assembly of the Mechanism", separate the mechanism from the cabinet bottom(16).

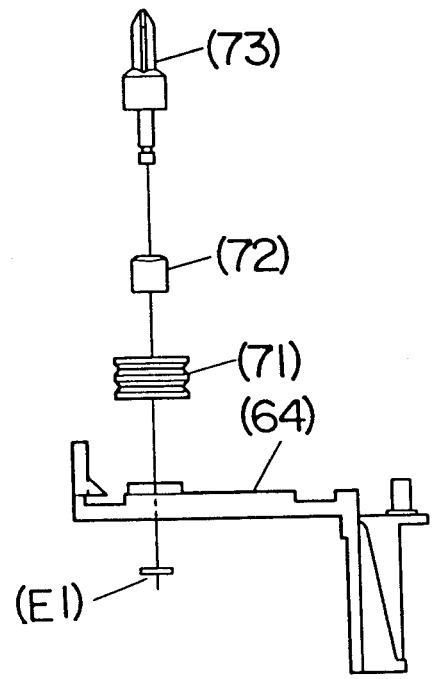
2. Unscrew the two screws(SP1).
3. Remove the motor pushing the motor to the inside of the mechanism softly.



☐ CLUTCH BEARING REPLACEMENT

SP-0930N uses the clutch bearing so that ribbon may rotate to only one direction. The steps of replacement are shown below.

1. Referring to the "C/R Motor Replacement" remove the C/R Motor away.
2. Remove the E-ring(E1), and separate the link-ribbon-drive(73) and pulley-ribbon-dirve from the holder-motor(64).
3. Remove the clutch bearing(72) inserted in the pulley-ribbon-drive(71).



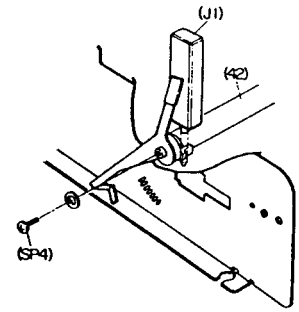
4. Pressing it, insert new clutch bearing into the pulley-ribbon-drive.
5. Place the carved plane of the clutch bearing(72) upward, and insert link-ribbon-drive as rotate it.

6. Insert the ribbon drive assembly into the holder motor(64), and fix the E-ring(E1).

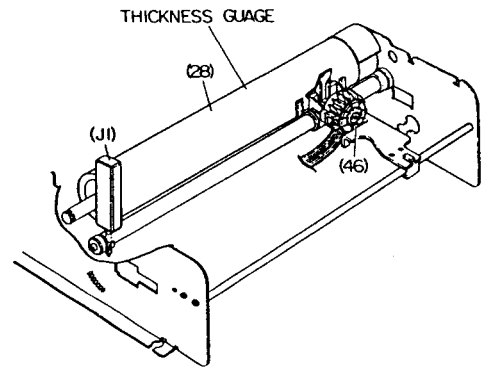
☐ LEVEL OF THE PRINTHEAD ADJUSTMENT

Printhead shaft which upholds the linear movement of the carriage must be always level for better letter quality. So level adjustment is very important.

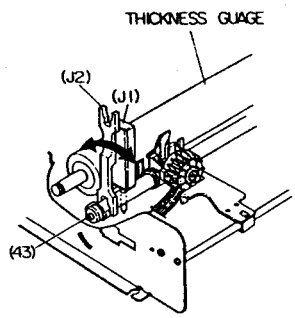
1. Insert jig(J1) into the hole of the printhead shaft(42), and unscrew the screw(SP4) with the printhead shaft fixed not to rotate.



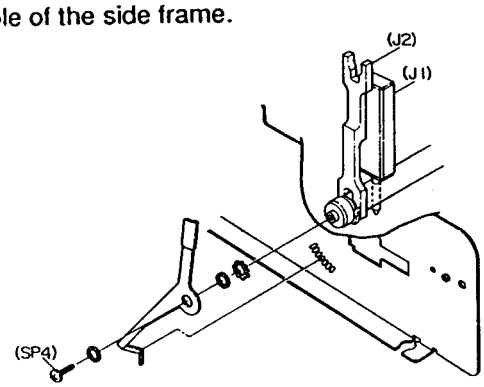
2. Move the carriage to the rightmost position. Moving the jig (J1) forward and backward as figure "Shown below, adjust the gap between the platen(28) and the printhead(46) to 0.35mm using the thickness guage.



3. Move the carriage to the leftmost position. After fixing the printhead shaft not to rotate, with the use of Jig(J1) adjust the gap between the platen and the printhead to 0.35mm moving the eccentric bush(43) forward and backward with the use of jig(J2).



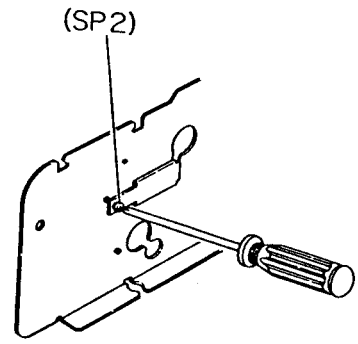
4. Fix the screw and the eccentric bush not to rotate. Tighten the screw for the printhead gap adjustment lever to fit into the fourth hole of the side frame.



5. Check if the eccentric bush(43), (44) rotates simultaneously as the print head gap adjustment lever rotates. Check if the gap of the right side and that of the left side are equal.

☐ TENSION OF THE TIMING BELT ADJUSTMENT

Tension of the timing belt must be adjustmented properly because it is the factor that influence on the letter quality together with the level of the printhead shaft and the platen. Check the letter quality running self-test in NLQ mode, and adjust the tension of the timing belt using the screw(sp2).



CHAPTER 6
NOTES

☐ INSTALLATION OF SERIAL OPTION BOARD

Follow these steps.

1. Make sure you have both the serial option board and appropriate cable.
2. Pull out the platen knob of the right side of printer.
3. Loosen all the screws that are engaged to the Top Case Cover.
4. Take off the Top Case Cover and you can see the two connectors near the Centronics connector.
5. Plug the serial interface board into this connector like indicated on the following figure.
6. Set the DIP switches as the operating conditions you want.
7. Hook the connection cable to the computer and printer.
8. Put back the Case Cover, tighten the screws and push the platen knob.
9. Now the control firmware in the printer can detect the fact that serial board is installed automatically and you can use the printer with serial communication.

NOTE	*Once the serial interface board is installed, you can not use the parallel interface unless you remove serial board.*

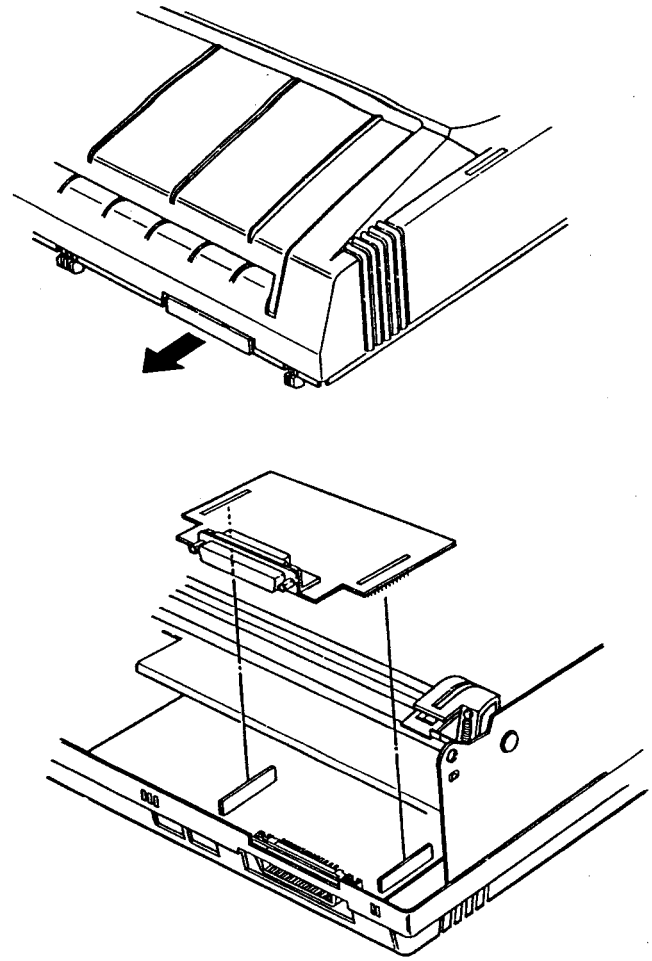


Figure: Installing the serial interface board.

☐ CAUTIONS

1. Overtightening a screw may damage the thread of the screw hole.
2. Never apply the power with the ROM chip being removed. Drivers will be failed within a few seconds.
3. To start the self-test without the printer cover being closed.
4. Clean the case and covers with a soft cloth. Use any mild commercial cleaner.
5. The platen should be cleaned with denature alcohol only.
6. The carriage guide bar can be lubricated with a very light oil.
7. Dust and paper trash on the carriage shaft and the carriage guide shaft may obstruct the movement of the carriage. Clean them with a soft cloth.

☐ LUBRICANTS

Durability of the printer is greatly affected by the type of lubricant employed. Followings are the lubricants for exclusive use with the printer and it is recommended that only those lubricants designated be used.

GREASE ALVANIA : NO2 (SHELL)
Mainly for gear and shafts.

X100 10W/30 (SHELL)
Mainly for carrige shaft (friction surface).

Screw-lock agent commercially available

CHAPTER 7
PROBLEM SOLVING

☐ CODING SOLUTIONS

Because each computer system deals with ASCII codes differently, it is impossible to provide solutions for all potential problems in a brief explanation. It may help, however, to be aware of some generic problems and some ways to handle them.

There are four common approaches.
First, to buy an alternative interface board for user's system. This is the best solution for 7 - bit system problems. See user's computer dealer for advice about this.

The second approach is to use commercially available software that is specifically designed to overcome this coding problem. Consult computer publications to see if a program for user's computer system is available.

The third approach is to avoid the software that is changing the codes. On most computers user can send each code directly to the printer port. This bypasses the BASIC interpreter and avoids the interface. But, this process is also different for each computer system.

The fourth approach is to change the printer driver program in user's system. This requires a knowledge of machine language and of the way user's computer works.

☐ SOLUTIONS FOR SPECIFIC SYSTEMS

The next subsections illustrate dealing with interface puzzles on various computers.

☐ *Applesoft BASIC Solutions*

Applesoft BASIC does not use PRINT to send data to the screen and LPRINT to send data to the printer as Microsoft BASIC does. Therefore, put a PR#1 at the beginning of a program and change all instances of LPRINT to PRINT.

If one of the example programs contains an INPUT statement or a PRINT statement, a message should go to the screen before anything is sent to the printer. In these programs, leave the first lines as they are and after the INPUT and/or PRINTER statements, add a line that states PR#!. Then change all the instances of LPRINT to PRINT and put a line that states PR#0 at the end of the program.

☐ *Apple II Solutions*

Apple II computers pose two types of problems. The first is that the Apple II is an 8 bit computer, but its printer interface handles only seven bits. The second is that there is one problem code number; nine.

The printer interface card furnished with the Apple II computer passes only seven bits to the printer, which means that user has a seven bit system. Should user need an 8 bit system, the simplest solution is to purchase a new printer interface card from computer dealer. Such a card is available for the Apple II.

The Apple II uses CHR$(9) to initialize the printer. This code and the following character or characters are intercepted by the printer interface card and used to change modes. User can divert all output to the printer instead of to the screen by sending the following line to the printer.

```
PR#1
print CHR$(9)"80N"
```

Then type anything, followed by enter key.
The CHR$(9)"80N" code directs all subsequent output to the printer up to 80 characters per now. User can cancel this typing;

```
PTINT CHR$(9)"I"
or
PR#9
```

The problem is that the SP-0930N uses CHR$(9) to activate horizontal tabulation and can also use it in graphics programs. When user send this code, however, user's system interprets it as a printer initialization code and the program does not work properly. In these cases, use the following method to change printer initialization code to a number that is not used in the program. For example, user can change user's initialization code to one by typing;

```
PR#!
PRINT CHR$(9);CHR$(1)
```

☐ *IBM-PC Solutions*

There are two problems using the IBM Personal Computer BASIC to drive a printer. First, the IBM-PC BASIC inserts a carriage-return/line-feed(CR-LF) after each 80 characters user sends it. Second, it adds an LF to each CR in an LPRINT statement.

Here is the way to adjust the width when it is the only problem. Tell the computer that the print line is wider than 80 characters with this WIDTH statement;

```
WIDTH "LPT1:",255
```

The 255 is a special number that prevents the computer system from inserting a CR-LF into the line - unless, of course , there's one in your program.

The extra line feed - CHR$(10) - that accompanies each carriage return - CHR$(13) - does not cause a problem unless user needs to use CHR$(13) in a graphics program. Getting rid of the extra CHR$(10) is rather complicated. First user opens the printer as a random file;

```
OPEN "LPT1:" AS #1
```

Although this allows user to send any code to the printer, user can no longer use the LPRINT command. Instead, user must use a PRINT #1 command;

```
PRINT #1, "PRINT TEST"
```

This does allow user to print anything, but it ignores any previous WIDTH statement.

If user want to print more than 80 characters per line in a graphics program, user must change his opening statement to include the appropriate WIDTH statement;

```
OPEN "LPT1:" AS #1 : WIDTH #1,255
```

☐ TROUBLE SHOOTING

Most problems associated with the printer can be traced to improper setup, installation, or cabling.

Symptom	Possible Cause	Probable Solution
Printer Dead	No AC power Fuse blown	Check power code Replace fuse
Power on but printer not printing	Printer not ON LINE Out of paper	Press ON LINE switch Replace paper
Printer won't go ON LINE	Out of paper	Replace paper
Paper slips around platen	Paper feed selector is in TRACTOR position	Set selector to FRICTION
Head moves but does not print	Ribbon not installed correctly Head gap is not adjusted properly	Re-insert ribbon Set head gap properly
Paper bunches up around platen	No reverse tension on paper	Set paper supply lower than printer
Printout double-spaced or no spacing	AFXT switch improperly set	Set DIP switch 1-3: as required

☐ *DC Power Problem*

Symptom	Possible Cause	Probable Solution
All DC power is supplied improperly	Fuse blown	Replace fuse
+36V power is supplied improperly	Head driver is out of order	Refer to 'Head Driver Trouble Shooting'
+14V power is supplied improperly	Head driver is out of order	Refer to 'Head Driver Trouble Shooting'
	R33 blown	Replace R33
+5V power is supplied improperly	Logic Device is out of order(the oscillating cycle of the U22/2 is greater than that of the figure 8-1)	Logic Device Check
	R34 blown	Replace R34

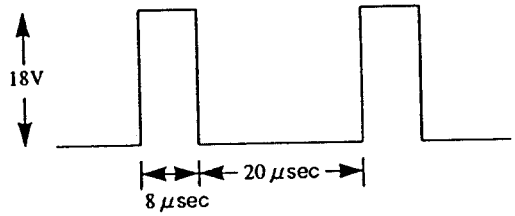


Figure 7-1

☐ *System Reset Problem*

Symptom	Probable Solution
When power on, $\overline{\text{RESET}}$(6u: Na/!) signal(U7/40) is not equal to that of the figure 4-2.	Reset IC(U18) Check
02 and 00 signal of the CPU(U7) is not equal to that of the figure 7-2.	X-tal oscillating circuit (U11, U9) check. CPU(U7) check if 0_0 signal is normal but 0_2 is abnormal
Interrupt signal of the CPU(U7) is not equal to that of the figure 7-2.	Measure the signal level of logic device, and check the failed device. (Low level $\leq$ 0.7V, High level $\geq$ 2.4V)

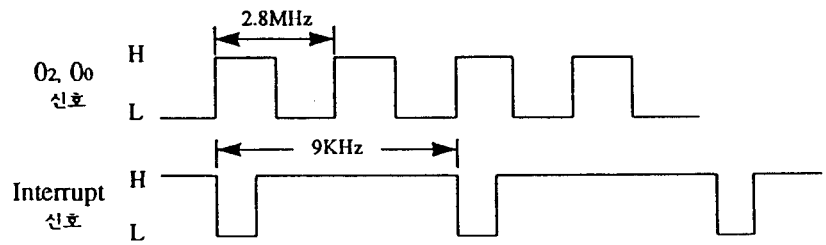


Figure 7-2

☐ *Head Pin Drive Problem*

1. Adjust the gap between the head and the platen (0.35mm).
2. Check if the head coil is wrong with measuring of each head pin resistance.

Normal : 8Ω ± 5%

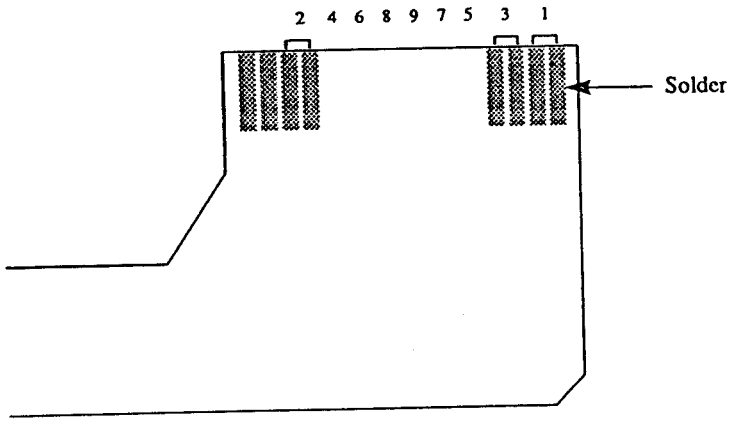


Figure 7-3 Arrangement of head cable pin

3. Check if R33 is blown(R33 is +14V protective resistor).
4. Check if the waveforms of the point A and B of each head pin driver are equal to that of the page 4-9 when head drives. If not, replace the wrong driver.

☐ *CR/LF Motor Drive Problem*

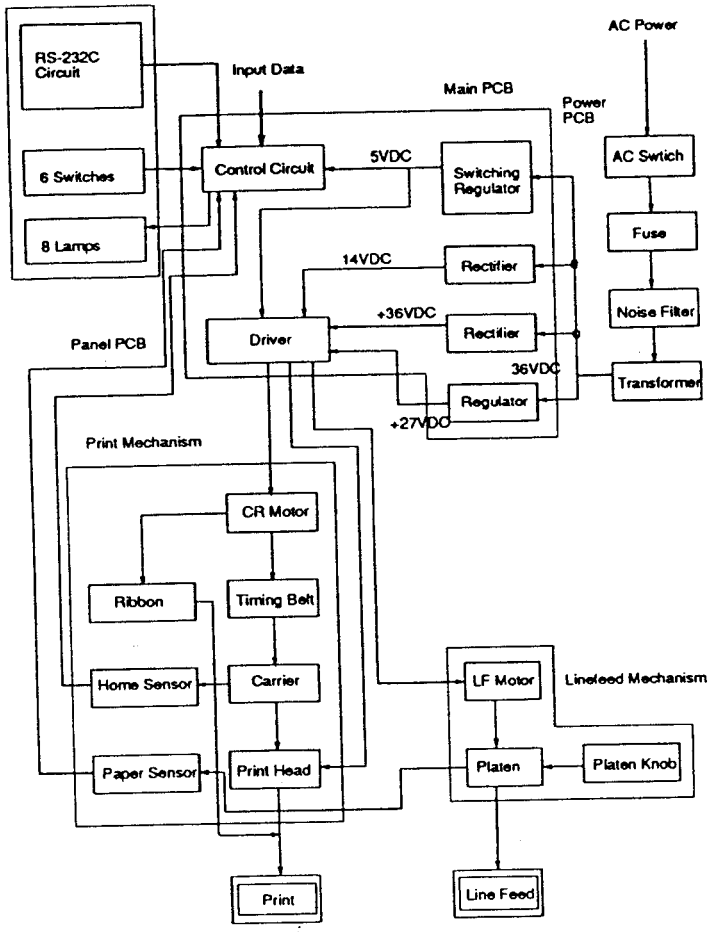
1. After pulling up the motor cable measure the resistance between each coil. Check if motor is wrong.

   - CR Motor : 5Ω ± 10%
   - LF Motor : 13.5Ω ± 7%

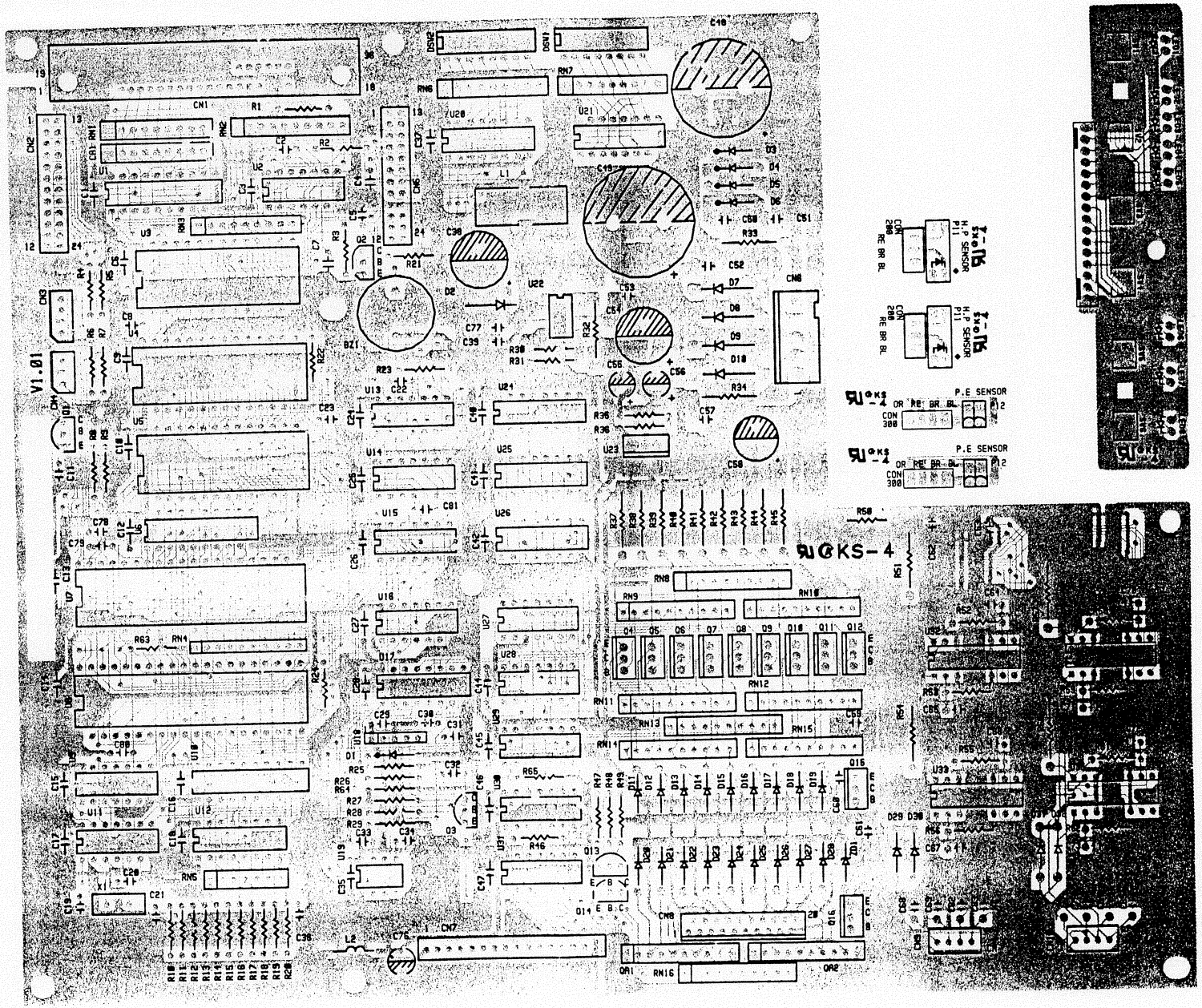
2. Check if the protective resistor R50 is blown

3. Measure the waveforms of the point 1 and 15 of each Motor driver, and check if +36V switching is properly operating when motor drives. If not, replace the wrong driver.

APPENDIX A
BLOCK DIAGRAM



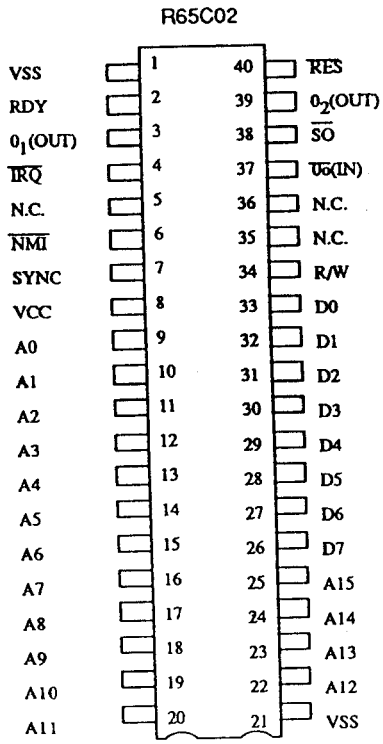
APPENDIX B
PCB PATTERN


V1.01
VUCKS-4
VUCKS-1
P.E SENSOR
H.P SENSOR
CON 300
OR RE BR BL

APPENDIX C
DEVICE LEAD IDENTIFICATION

☐ CPU R65C02

PIN ASSIGNMENTS

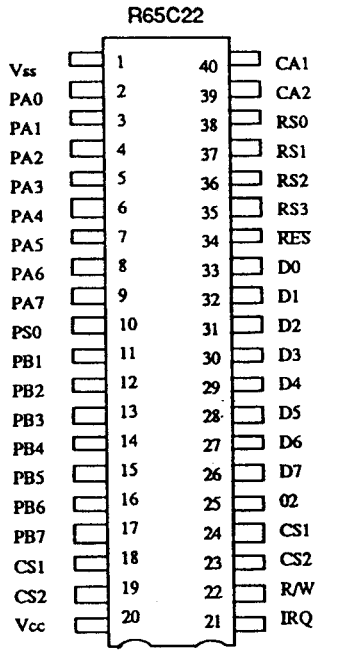


Note: N.C. means no connection (not used)

FEATURES

- CMOS Silicon gate technology.
- Low power(4mA/MHz).
- Software compatible with R6502.
- Single 5V (±5%) power supply requirments.
- Eight bit parallel processing.
- Decimal and binary arithmetic.
- True indexing capability.
- Programmable stack pointer.
- Interrupt capability.
- Non-maskable interrupt.
- Eight-bit bidirectional data bus.
- Addressable memory range of up to 64K bytes.
- "Ready" input.
- Direct memory access(DMA) capability.
- Memory lock output.
- 1MHz, 2MHz, 3MHz, and 4MHz versions.
- On-chip clock options.
  - External single clock input
  - Direct crystal input(/4)
- Commercial and industrial temprature versions.
- Pipeline architecture.
- Slave processor version (R65C112).

☐ ACIA R65C22

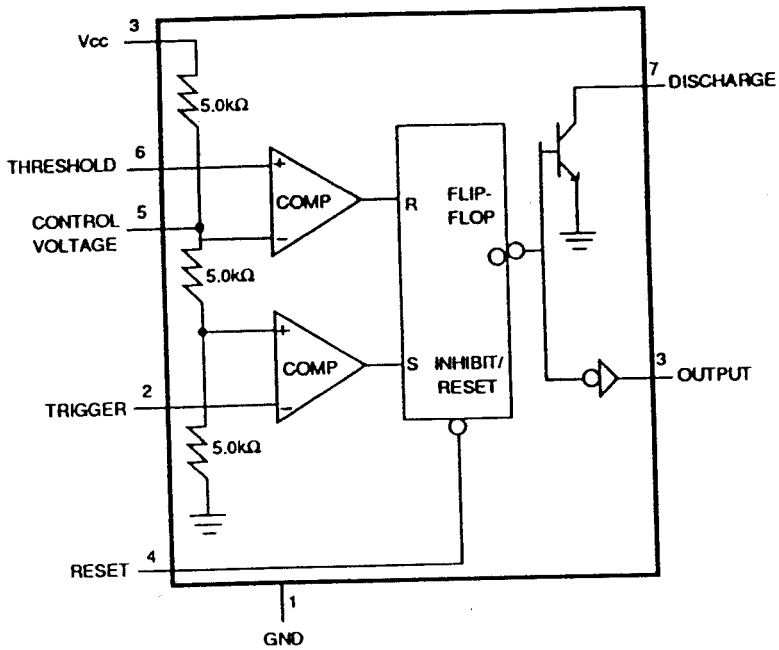


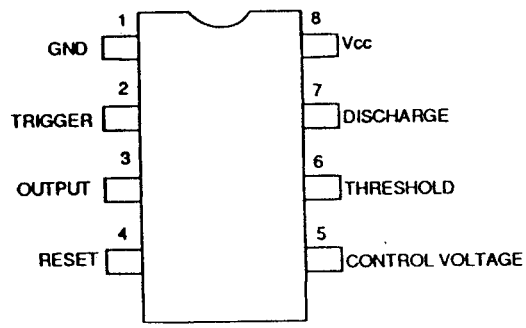
Note: N.C. means no connection (not used)

FEATURES

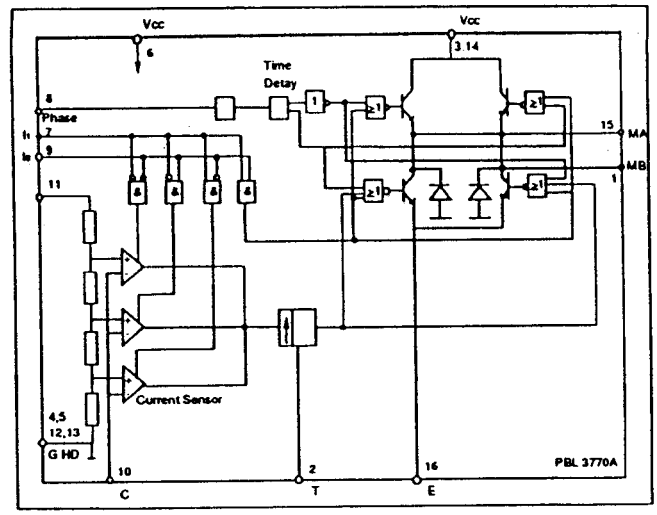
- Low power CMOS N-well Silicon gate technology
- Fully compatible with NMOS 6522 devices
- Two 8-bit bidirectional I/O ports
- Two 16-bit programmable timer/ counters
- Serial bidirectional peripheral I/O
- TTL compatible peripheral control lines
- Expanded "handshake" capability allows positive control of data transfers between processor and peripheral devices.
- Latched output and input registers on both I/O ports
- 1, 2, 3 and 4 MHz operation
- Single +5V power supply
- 40-pin ceramic or plastic DIP

☐ TIMER NE555

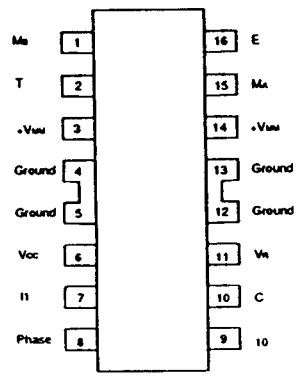

Vcc
3
5.0kΩ
THRESHOLD
6
CONTROL VOLTAGE
5
5.0kΩ
COMP
COMP
R
S
FLIP-FLOP
INHIBIT/ RESET
7
DISCHARGE
3
OUTPUT
TRIGGER
2
5.0kΩ
RESET
4
1
GND


1
GND
2
TRIGGER
3
OUTPUT
4
RESET
8
Vcc
7
DISCHARGE
6
THRESHOLD
5
CONTROL VOLTAGE

☐ STEP MOTOR DRIVER PBL 3770A/PBL 3717A



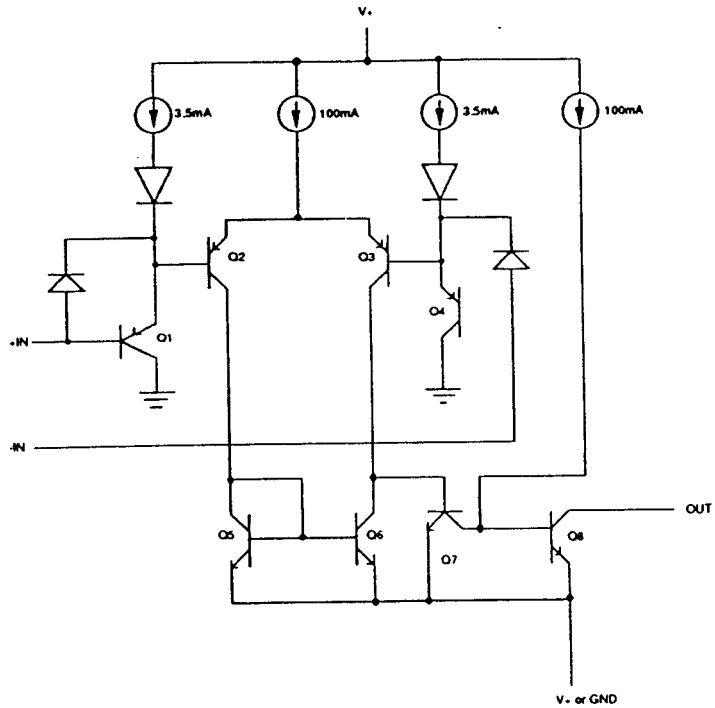
FEATURES

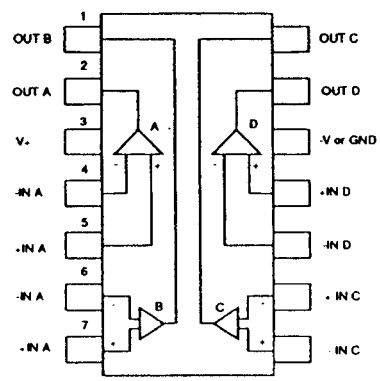


- Half-step and full-step operation.
- Switched mode bipolar constant current drive.
- Wide range of current control 5 - 1800mA.
- Wide voltage range 10 - 45V.
- Designed for unstabilized motor supply voltage.
- Current levels can be selected in steps or varied continuously.
- Thermal overload protection.

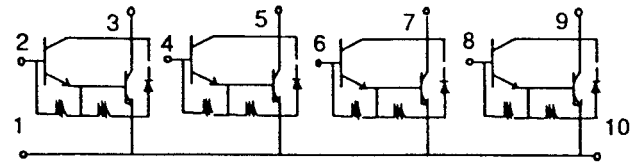
* PBL 3770A does not have internal recirculation diode, and it requires to be attached the external diode.

☐ COMPARATOR LM339

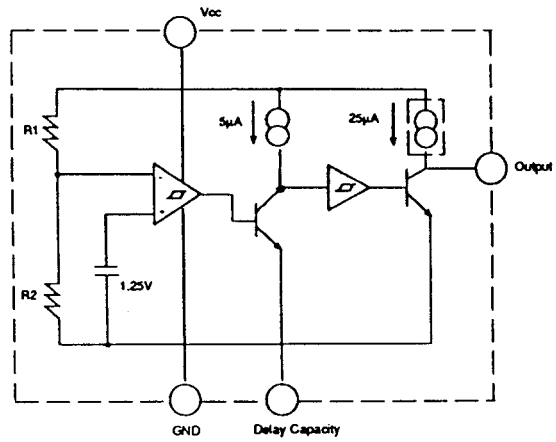


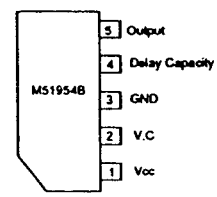


☐ TRANSISTOR ARRAY STA404A



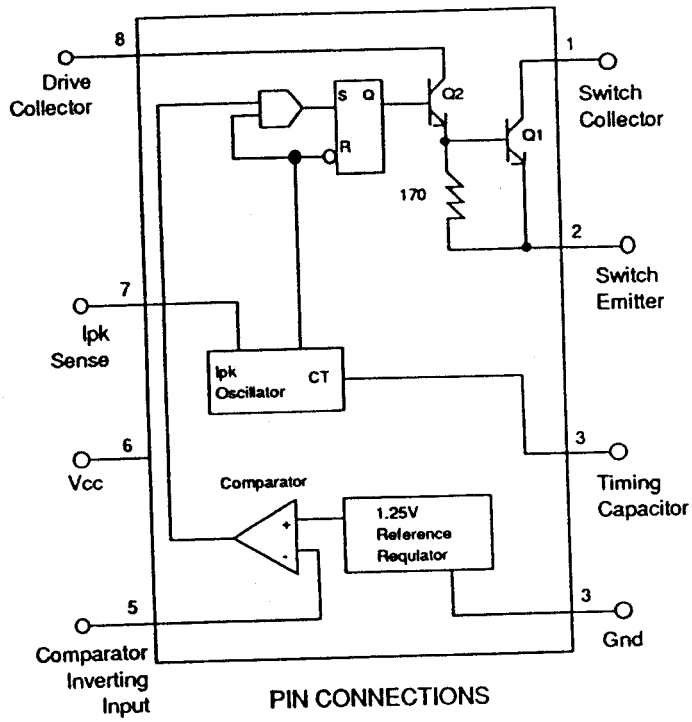
☐ RESET IC M51954B



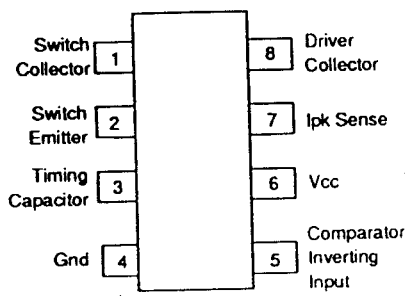


☐ DC TO DC CONVERTER MC34063

FUNCTIONAL BLOCK DIAGRAM



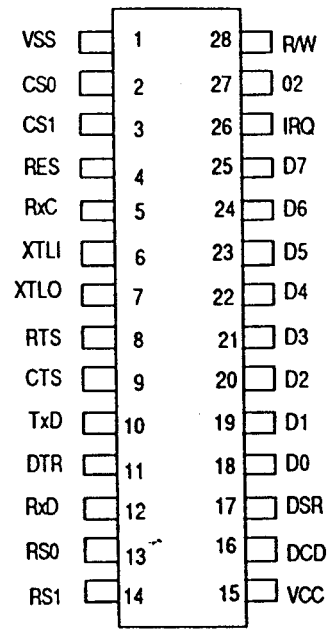
PIN CONNECTIONS



(Top View)

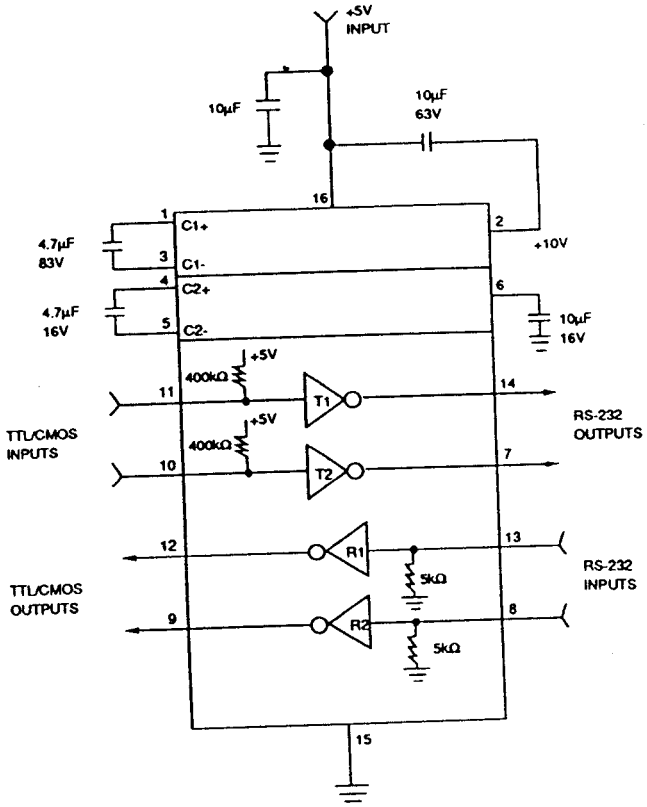
☐ ACIA R65C51

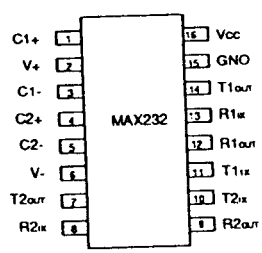
FEATURES



- Low power CMOS N-well silicon gate technology.
- Direct replcement for NMOS R6551 ACIA.
- Full duplex operation with buffered receiver and transmitter.
- Data set/modem control functions.
- Internal baud rate generator with 15 programmable baud rates(50 to 19, 200).
- Program-selectable internally or externally controlled receiver rate.
- Progammable word lengths, number of stop bits, and parity bit generation and detection.
- Programmable interrupt control.
- Programmable reset.
- Program-selectable serial echo mode.
- Two chip selects.
- 1 or 2 MHz operation.
- 5.0 Vdc±5% supply requirements.
- 28-pin plastic or ceramic DIP.
- Full TTL compatibility.
- Compatible with R6500, R6500/* and R65C00 micro-processors.

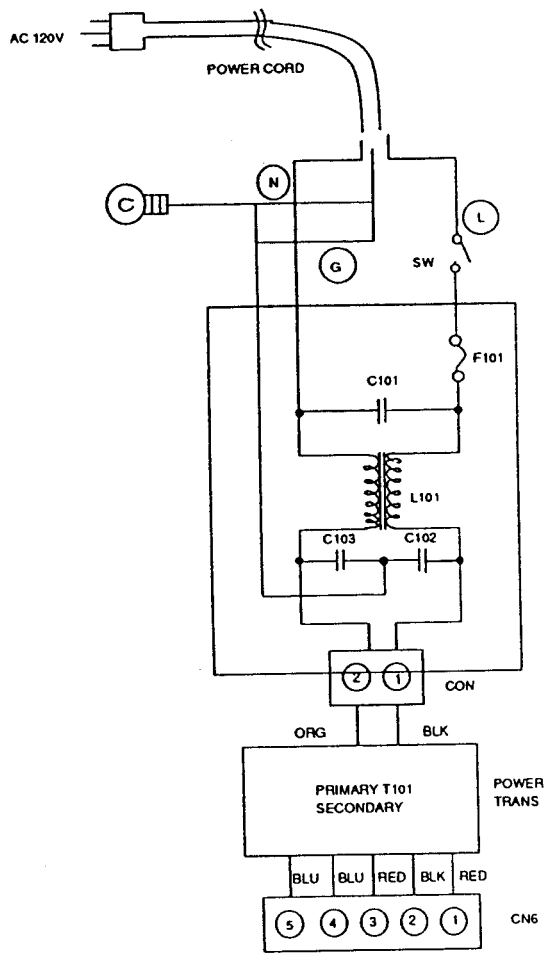
☐ +5V Powered RS-232 Drivers/Receivers



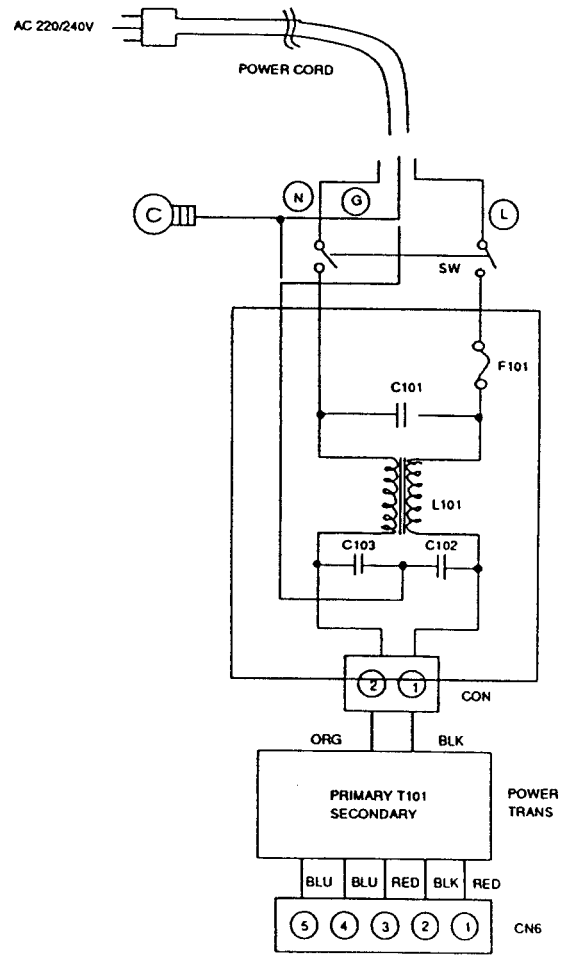


APPENDIX D
PRIMARY CIRCUIT DIAGRAM

☐ PRIMARY CIRCUIT DIAGRAM (FOR USA AND CANADA)



☐ PRIMARY CIRCUIT DIAGRAM (FOR EUROPE AND GERMANY)



APPENDIX E
PARTS LIST

☐ MAIN BOARD

PART NO	LOCATION	DESCRIPTION
01018-277-101	R2, R3, R4	R-CARBON;RD 1/4T 100-J
01018-277-102	R10, R11, R20 R28, R46, R47 R52, R52, R55 R58, R56	R-CARBON;RD 1/4T 1K-J
01018-277-103	R9	R-CARBON;RD 1/4T 10K-J
01018-277-121	R5, R6	R-CARBON;RD 1/4T 120-J
01018-277-153	R65	R-CARBON;RD 1/4T 15K-J
01018-277-331	R12, R13, R14 R15, R16, R17 R18, R19, R48 R49	R-CARBON;RD 1/4T 330-J
01018-277-433	R53, R56, R59 R62	R-CARBON;RD 1/4T 43K-J
01018-277-472	R1, R4, R7, R8, R24, R27, R63 R64	R-CARBON;RD 1/4T 4.7K-J
01018-277-562	R21, R23	R-CARBON;RD 1/4T 5.6K-J
01018-377-050	R37, R38, R39 R40, R41, R42 R43, R44, R45	R-CARBON;RD 1/2T 0.5-J

PART NO	LOCATION	DESCRIPTION
01018-377-050	R51, R54, R57 R60	R-CARBON;RD 1/2T 0.5-J
01045-427-027	R32	R-WIRE;RW IL 0.27-J
01048-257-363	R31	R-METAL,FILM;RM 1/4T 36K-F
01048-275-042	R29	R-METAL,FILM;RM 1/4T 2.44K-F
01048-275-121	R36	R-METAL,FILM;RM 1/4T 120-F
01048-275-123	R30	R-METAL,FILM;RM 1/4T 12K-F
01048-275-202	R25	R-METAL,FILM;RM 1/4T 2K-F
01048-275-562	R26	R-METAL,FILM;RM 1/4T 5.6K-F
01048-275-751	R35	R-METAL,FILM;RM 1/4T 750-F
01057-327-109	R34	R-FUSIBLE;RF 1/2P 1-J
01057-327-056	R33, R50	R-FUSIBLE;FRM 1/2P 0.56-J
01400-150-104	C1, C3, C6 C9, C10, C12 C13, C14, C15 C16, C17, C18 C24, C28, C35 C37, C40, C41 C42, C43, C44 C45, C46, C47	C-MONOLITHIC CERAMIC;A104Z17Z5UF5TAAC
01407-017-220	C19, C21	C-CERAMIC,TEMP;CC45(T) SL 50V 22-J
01407-018-560	C78, C79, C80	C-CERAMIC, TEMP; CC45(T) SL 50V 56-K
01416-318-102	C5, C7, C23, C77	C-CERAMIC,HK;CK45 B 50V 1000-K

PART NO	LOCATION	DESCRIPTION
01417-318-101	C31, C81	C-CERAMIC,HK;CK45(T) B 50V 100-K
01417-318-331	C4, C22, C36	C-CERAMIC,HK;CK45(T) B 50V 330-K
01417-318-471	C39	C-CERAMIC,HK;CK45 B 50V 470-K
01417-318-821	C64, C65, C66 C67, C70, C71 C72, C73	C-CERAMIC,HK;CK45(T) B 50V 820-K
01417-344-103	C 2	C-CERAMIC,HK;CK45(T) F 50V 0.01M-Z
01417-344-104	C8, C11, C20 C29, C30, C34 C50, C51, C52 C53, C57, C59 C60, C61, C62 C63	C-CERAMIC,HK;CK45(T) F 50V 0.1M-Z
01417-468-331	C68, C69,C74 C75, C82, C83 C84, C85	C-CERAMIC,HK;CK45(T) B 500V 330-K
01505-724-103	C32	C-POLYESTER;CQ921M(T) 100V 0.01-K
01505-725-104	C33	C-POLYESTER;CQ921M(T) 100V 0.1-M
01608-903-110	C76	C-ELECTROLYTIC;CE04W(T) 10uF 16V
01608-904-470	C55, C56	C-ELECTROLYTIC;CE04W(T) 25V 47M
01609-405-290	C58	C-ELECTROLYTIC;CE04W 50V 100M
02109-101-030	U14	IC-TTL;SN74LS02N
02109-101-050	U11	IC-TTL;SN74LS04N
02109-101-070	U 9	IC-TTL;74LS74A

PART NO	LOCATION	DESCRIPTION
02109-101-780	U2, U30, U31	IC-TTL;SN7406
02109-101-990	U13, U15	IC-TTL;SN74LS00N
02109-104-140	U 6	IC-TTL;74LS245
02109-105-090	U17	IC-TTL;DM74LS138 (N.S)
02109-105-120	U20, U21	IC-TTL;SN74LS257N
02109-105-140	U1, U10	IC-TTL;SN74LS374N
02109-302-200	U12	IC-TTL;SN74LS367AN
02109-105-750	U24, U25,U26	IC-TTL;SN74LS175
02109-301-840	U 7	IC-CPU;R65C02P3
02109-301-850	U 8	IC-USART;R65C22P3
02109-305-740	U16	IC-CMOS;MC74HC4078
02109-402-090	U 5	IC-SRAM;6264-150N
02119-301-330	U27, U28, U29	IC-COMPARATOR;LM339
02119-401-440	U32, U34	IC-STEP MOTOR DRIVER;PBL3717A
02119-401-470	U33, U35	IC-STEP MOTOR DRIVER;PBL3770A
02119-501-580	U19	IC-TIMER;NE555
02119-602-110	U22	IC-VOLT REGULATOR;MC34063 (MOTOROLA)
02139-103-387	Q14	TRANSISTOR;KSA733-Y(T)
02139-302-747	Q1 - Q3, Q13	TRANSISTOR;KSC945-Y(T)
02169-101-490	D29 - D32	DIODE;1N4937GP
02169-201-067	D3 - D6	DIODE;1N4002(T)

PART NO	LOCATION	DESCRIPTION
02169-201-067	D11 - D28	DIODE;1N4002(T)
02169-201-240	D7 - D10	DIODE;1N5402(G,I) (200V 3A, RECTRON)
02169-301-417	D1	DIODE;1N4148(T)
02169-301-530	D2	DIODE;1N5822(GI)
03001-000-310	PCB 1	PCB-MAIN;260 x 218 x 1.6T(FR-4)
00000-241-023	U18	IC-LINEAR;M51954BL
01060-807-102	RN 5	R-NETWORK;RGLD6X102J (MURATA)
01060-809-472	RN1, RN6, RN7	R-NETWORK;RGLD8X472J (MURATA)
01060-810-102	RN16	R-NETWORK;RGLD9X102J (MURATA)
01060-810-472	RN2, RN8, RN13	R-NETWORK;RGLD9X472J (MURATA)
301063-810-102	RN9, RN10	R-NETWORK;RGLD5Y102J (MURATA)
01063-810-123	RN14, RN15	R-NETWORK;RGLD5Y123J (MURATA)
01063-810-152	RN11, RN12	R-NETWORK;RGLD5Y152J (MURATA)
01603-904-471	C38, C54	E-ELECTROLYTIC,VENT;CE04W 25V 470M (13X20)
01603-904-472	C48, C49	C-ELECTROLYTIC;CE04W 25V 4700M
02109-402-420	U3	IC-EPROM;27512-200NS (SST)
02119-401-660	QA1, QA2	IC-TR ARRAY;STA404A (SANKEN)
02119-602-120	U23	IC-VOLT REGULATOR;KA337 (SST)
02159-101-140	Q4 - Q12	TRANSISTOR;TIP127 (SST)
02159-301-910	Q15, Q16	TRANSISTOR;TIP122 (SST)

PART NO	LOCATION	DESCRIPTION
02169-404-940	ZD1	DIODE-ZENER;MTZ39B (ROHM)
02429-055-010	L2	COIL-CHOKE;15UH
02429-061-510	L1	COIL-CHOCK;200UH/1A
03344-112-040	CN6	CONNECTOR-WAFER;5273-05A (MOLEX)
03344-061-116	CN7	CONNECTOR-WAFER;5046-16A (MOLEX)
03344-061-114	CN9, CN10	CONNECTOR-WAFER;5046-04A (MOLEX)
03344-062-020	CN4	CONNECTOR-WAFER;5045-03A (MOLEX)
03344-106-920	CN3	CONNECTOR-WAFER;5045-04A (MOLEX)
03344-163-110	CN8	CONNECTOR-FLEX;HLEM20S-1 (BURNDY)
03344-164-124	CN2, CN5	CONNECTOR-SOCKET;2543S24VU00 (LEOCO)
03344-165-636	CN1	CONNECTOR-D.SUB;MRD-36SB-140 (BURNDY)
03354-705-970	U3, U4	SOCKET-IC;WSDIF-28PIN
03599-027-310	DSW1, DSW2	SW-DIP;KSP08 (HANKUK RELAY)
04539-034-810	X1	CRYSTAL;5.6000MHZ (SUNNY)
04739-000-210	BZ1	BUZZER-PIEZO;PKM17EPP-4001 (MURATA)

☐ HOME POSITION SENSOR BOARD

PART NO	LOCATION	DESCRIPTION
03054-653-810	CON200	CONN-ASSY'5102-03P, 5103PBT, 1007#26 L=200MM
02199-003-010	PI 1	PHOTO INTERRUPTER;GP1S53 (SHARP)
03001-000-340	PCB 4	PCB-SENSOR, HP;48X29X1.6T

☐ PAPER-END SENSOR BOARD

PART NO	LOCATION	DESCRIPTION
03054-653-910	CON300	CONN-ASSY;5102-04P, 5103PBT, 1007#26 L=200MM
02199-003-020	PI 2	PHOTO INTERRUPTER;GP2S05 (SHARP)
03001-000-350	PCB 5	PCB-SNESOR, PE;44X13X1.6T

☐ PANEL BOARD

PART NO	LOCATION	DESCRIPTION
02309-112-150	LED1, LED5	LED;KLR 124E(KEC)
02309-112-150		LED;KLR 124E(KEC)
02309-112-170	LED2 - LED4 LED6 - LED8	LED;KLG 124E(KEC)
03053-609-310	CON1	CONN-ASSY;5102-16P, 5103PBT, 1007#26 L=250MM
03344-165-116	CON1	CONNECTOR-WAFER;5045-16A (MOLEX)

☐ POWER BOARD

PART NO	LOCATION	DESCRIPTION
00659-424-940	TH	TUBE-HISHI;GSHS-1625 125'C 6X0.25 BLK (FD9.4)
02869-303-010	TRANS	TRANS-POWER;P:120V S:14V18V36V (DONGYANG)
02869-303-710	TRANS	TRANS-POWER;P:220V S:14V, 18V, 36V (DONGYANG)
02869-303-810	TRANS	TRANS-POWER;P:240V S:14V, 18V, 36V (DONGYANG)
03053-607-320	MEC+G	CONNECTOR-AC, GROUND CJ-4681
03053-818-310	CORD	POWER-CORD,AC;HSP-30,SVT #18AGW 60C (MOONSUNG)
03053-818-510	CORD	POWER-CORD ASS'Y; LP34(A) H05W-F 310.75MM 8FT
03053-818-610	CORD	POWER-CORD ASS'Y;GTBS-31SQMM BLK
03344-656-410	SW+L	CONN-TERMINAL ASS'Y;L=50M/M SIP-LV
03539-011-120	SW	S/W-SEE SAW,ROCKER;12A 125VAC 250V 6A
04709-088-010	F101	FUSE;51S, 250V 1.25A
01461-136-806	C102, C103	C-CERAMIC,AC;CK45 B 250V 2200-M
01566-512-104	C101	C-M,POLYERSTER,AC;CQS922M 250V 0.1M-K (KOREA)
02429-254-010	L101	COIL-FILTER;3MH

PART NO	LOCATION	DESCRIPTION
03001-000-330	PCB3	PCB-POWER;65X70X1.6T (FR-4)
03124-700-810	L, N, G	PIN-GT;14.2MM 2.35PI
03124-700-810	N	PIN-GT;14.2MM 2.35PI
03124-700-810	G	PIN-GT;14.2MM 2.35PI
03344-159-010	CON	CONNECTOR-WAFER;5096-02C (MOLEX)
03364-700-210	F101	HOLDER-FUSE;FC51E 20M/M FUSE

☐ MECHANISM

PART NO	DESCRIPTON	NO
06001-933-010	CARTNET-TOP	1
07652-700-510	WINDOW-COVER	2
06051-700-510	COVER-TRACTOR	3
06462-702-710	GUIDE-CUTSHEET	4
06463-703-410	GUIDE-EXTENSION	5
06464-702-710	WIDTH-ADJUSTOR, L	6
06464-702-610	WIDTH-ADJUSTOR, R	7
06434-700-610	SEPARATOR PAPER	8
06434-700-710	SUPPORT-GUIDE	9
07623-711-210	KNOB-PLATEN	10
07602-773-010	PANEL-KEYPAD	11
07653-701-710	WINDOW-LED	12
07623-711-320	KNOB-KEYPAD	13
08463-700-710	RUBBER-PANEL, KEY	14
OP902-000-0260	ASSY-PANEL	15
06001-934-010	CABINET-BOTTOM	16
04542-710-810	SHIELD-PLATE, PCB	17
OP903-000-0130	ASSY-MAIN	18
02869-303-010	TRANS-POWER	19
OP903-000-0140	ASSY-POWER	20
05203-701-910	TRACTOR-UNIT, R, ASSY	21
05203-702-010	TRACTOR-UNIT, L, ASSY	22
06464-702-510	STRETCH-PAPER	23
05102-700-110	SHAFT-DRIVE, TRACTOR	24
05103-702-310	SHAFT-GUIDE, TRACTOR	25
05124-701-510	BEARING-TRACTOR	26
05204-703-810	SPROCKET-TRACTOR	27
05292-700-110	PLATEN	28
06644-702-610	STOPPER-PLATEN	29
05124-900-420	BEARING-PLATEN	30

PART NO	DESCRIPTION	NO
06401-700-610	GUDIE-PAPER	31
06614-727-910	BRACKET-PE, SENSOR	32
03001-000-350	PCB-SENSOR PE	33
05103-702-010	SHAFT-FRICTION	34
05223-701-810	ROLLER-FRICTION	35
06463-702-910	GUIDE BLOCK	36
06674-717-010	SPRING-GUIDE-BLOCK	37
05252-701-210	LEVER-FRICTION	38
06674-717-110	SPRING-LEVER, FRIC	39
06022-702-710	FRAME-BOTTOM	40
06454-700-310	FLEXIBLE-GUIDE	41
05103-702-110	SHAFT-PRINT, HEAD	42
05113-700-210	BUSHING-ECCENTRIC, L	43
05113-700-510	BUSHING-ECCENTRIC, R	44
07334-701-510	WASHER-SHAFT	45
04951-100-110	PRINTHEAD-ASSY	46
06461-700-510	GUIDE-RIBBON	47
06453-700-110	MASK-RIBBON	48
06421-700-710	CARRIAGE	49
05124-701-220	BEARING-CARRIAGE	50
05124-700-910	BEARING-SLIDING	51
05103-702-210	SHAFT-PRINT, REAR	52
06603-704-710	HOLDER-CABLE	53
05254-707-010	LEVER-ECCENTRIC	54
05104-710-310	SHAFT-BAIL	55
05224-704-110	RULLER-BAIL	56
06464-701-910	GUIDE-BAIL, ROLLER	57
06652-700-910	SUPPORT-BAIL, L	58
06652-700-810	SUPPORT-BAIL, R	59
06674-717-410	SPRING-SUPPORT, BAIL L	60

PART NO	DESCRIPTION	NO
06674-717-310	SPRING-SUPPORT, BAIL R	61
05104-710-710	SHAFT-SUPPORT, BAIL	62
04769-100-060	MOTOR STEPPING	63
06601-703-110	HOLDER-MOTOR	64
	PULLEY-IDLE, 25	65
05274-701-910	BELT-SYNCHRD, 323T	66
05104-709-810	SHAFT-PULLEY, 125	67
06863-700-210	TENSION-ADJUSTOR	68
05104-710-610	SHAFT-IDLE, LEFT	69
05124-701-110	BEARING-RIBBON, DRIVE	70
05214-701-910	PULLEY-RIBBON, DRIVE	71
05154-700-310	CLUTCH	72
05264-702-610	LINK-RIBBON, DRIVE	73
05274-701-810	BELT-RIBBON, DRIVE	74
OP904-000-0090	ASSY-SENSOR HP	75
06021-702-810	FRAME-LEFT	76
06834-900-410	CUSHION-LEG, F	77
06864-901-210	SPACER	78
06021-702-910	FRAME-RIGHT	79
05104-710-010	SHAFT-GEAR, 64/32T	80
05203-701-310	GEAR-IDLE, 64/32T	81
05104-710-110	SGAFT-GEAR, 60/28T	82
05204-710-110	GEAR-IDLE, 60/28T	83
05203-701-210	GEAR-PLATEN	84
07334-901-510	WAVE WASHER	85
07364-900-910	SPRING-PIN, PL	86
05203-701-610	GEAR-IDLE, 36T	87
05104-710-210	SHAFT-GEAR, 60T	88
05263-700-310	LINK-PAPER, PARK	89
05203-701-710	GEAR-IDLE, 60T	90

PARTN NO	DESCRIPTION	NO
05203-701-510	GEAR-TRACTOR	91
04769-100-070	MOTOR-STEPPING	92
06614-727-810	BRACKET-POWER, CORD	93
06634-902-910	CLAMPER-CORD	94
03053-818-310	POWER-CORD AC	95
08464-903-912	FOOT-RUBBER	96
07008-130-061	SCREW-PH	SP1
07008-130-101	SCREW-PH	SP2
07008-140-061	SCREW-PH	SP3
07008-140-081	SCREW-PH	SP4
07008-140-101	SCREW-PH	SP5
07008-140-121	SCREW-PH	SP6
07018-130-121	SCREW-PH	SF1
07128-530-122	SCREW-TAP, TH	ST1
07128-540-061	SCREW-TAP, TH	ST2
07128-540-161	SCREW-TAP, TH	ST3
07154-230-081	SCREW-TAP, PH	ST4
07308-103-001	WASHER-PLAIN	WP1
07308-104-001	WASHER-PLAIN	WP2
07318-103-001	WASHER-SPRING	WS1
07318-104-001	WASHER-SPRING	WS2
07328-203-001	WASHER-TOOTHED	WT1
07328-204-001	WASHER-TOOTHED	WT2
07358-102-003	RING-E	E1
07358-104-003	RING-E4	E2
07358-105-003	RING-E	E3
07358-106-003	RING-E6	E4
07358-108-003	RING-E8	E5